



Scanning -- Shortwave -- Satellites -- Ham Radio -- Computers

Monitoring Times

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August 2004

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Where in the world are you? Ask GPS



Also in this issue:
Radio Technology for the 21st Century
The Birth of the Radio Networks
ICOM's IC-R8500 Revisited
Garmin's Outstanding Rino 130 GPS

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S-meter sensitivity: 0.1 μ V



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Monitoring Times

Vol. 23, No. 8

August 2004



Cover Story

GPS - Location, Location, Location

By Devin Greaney

Originally designed to support the global activities of the US military, twenty-four Global Positioning Satellites now enable anyone, anywhere, to pinpoint his exact location on the earth. This astonishing open technology is now being used in innumerable applications in business, industry, government, recreation, and more.

The author introduces us to a few of these applications and chats with some users about the difference GPS has made to their occupation or sport.

On our Cover: The author hikes into the wilderness with a Garmin Legend in hand.

The Birth of the Radio Networks 16

By Marc Ellis

If you wonder where the wheeling and dealing behind today's broadcast industry came from, just look to its roots. The birth of the radio networks is a fascinating, though not necessarily pretty, story. Let us take you back to the days of the "Radio Craze"...

A Museum for You 20

By Leon Fletcher

Headed out to Reno this summer? Let us suggest a worthwhile side trip to the historic village of Virginia City, Nevada, and the award-winning Western Historic Radio Museum. Owner/operator/curator Henry Rogers, WA7YBS, will make you welcome and show you around the hundreds of radios and accessories, including a vintage 1912 spark gap wireless station.

21st Century Radio Communications 23

By John Catalano

Have you been puzzled or intrigued by mentions in the press of digital radio, software defined radio, cognitive radio, configurable radio, etc? Are these concepts just pipe dreams, or do they describe technology that will impact radio within our lifetimes?

John Catalano sets out to answer these questions and more in a three-part series on 21st Century Radio. Part One describes the developments of the last quarter of the 20th century that have brought us to the brink of a new era in radio. Which way will the market swing?

Reviews:

Most GPS receivers can show you your location quite accurately; it's what they help you do with the information that sets them apart from each other. The new **Garmin Rino 130** is a prime example of the very best in a GPS receiver combined with the very best in an FRS/GMRS receiver – it'll simply knock your socks off! (See page 86.)

Seven years of use is certainly long enough to know if you like a radio or not, and Bob Parnass wants to tell you why he still likes his **ICOM IC-R8500**. No seven-year itch for this relationship! (See page 78.)

Since it was "for free," John Catalano thought it was worth doing the legwork to check out **HamScope** for computer control, decoding, logging, etc. HamScope requires a number of other readily-available programs in order to build a full-featured package; it turned out to be easy to use and very valuable for listeners as well as hams (page 80).

Still on the fence about satellite radio service? Ken Reitz compares the hardware side of the question: the **Sirius AudioVox** versus the **XM SkyFi** receiver (page 85), plus a few hints regarding content and other hardware as well.

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TABLE OF CONTENTS

Departments:

| | |
|--|----|
| Letters | 6 |
| Monitoring and the Law | 8 |
| <i>Pranks Result in Federal Conviction</i> | |
| Communications | 10 |
| Stock Exchange | 90 |
| Advertisers Index | 90 |
| Closing Comments | 92 |
| <i>The Future of the Radio Hobby</i> | |

First Departments

| | |
|---------------------------------------|----|
| Getting Started | |
| Beginners Corner | 26 |
| <i>New Tricks for Old Dishes</i> | |
| Ask Bob | 28 |
| Bright Ideas | 29 |
| Scanning Report | 30 |
| <i>Reshuffling the Frequency Deck</i> | |
| Scanning Canada | 33 |
| <i>Frequency Hogs in Hogtown</i> | |
| Utility World | 34 |
| <i>Unauthorized Utes in Ham Bands</i> | |
| Utility Logs | 35 |
| Digital Digest | 37 |
| <i>Tunisian Diplo and 4XZ</i> | |
| Global Forum | 38 |
| <i>Radio Mexico Intl Closes Down</i> | |
| Broadcast Logs | 41 |
| The QSL Report | 42 |
| <i>The Lure of QSLing Lighthouses</i> | |
| Programming Spotlight | 43 |
| <i>The Right Tool for the Job</i> | |

Listening Guide

| | |
|-------------------------------------|----|
| English Language SW Guide | 44 |
| <i>Selected Programs by Type</i> | |
| MT Satellite Services Guide | 70 |
| <i>Galaxy 11, 3C, Americas 6, 5</i> | |

Second Departments

| | |
|--|----|
| Milcom | 64 |
| <i>Sub-bands in UHF Milair Spectrum</i> | |
| Boats, Planes, and Trains | 66 |
| <i>Radio Modernizes the Rails</i> | |
| American Bandscan | 68 |
| <i>International Notes</i> | |
| Outer Limits | 69 |
| <i>Anti-Castro Clandestines via Aircraft</i> | |
| Below 500 kHz | 71 |
| <i>Giving Something Back</i> | |
| On the Ham Bands | 72 |
| <i>Are You Ready?</i> | |
| Antenna Topics | 74 |
| <i>Some Vertical Antennas</i> | |
| Radio Restorations | 76 |
| <i>Starting up Your Project</i> | |

MT Reviews

| | |
|--|----|
| Scanner Equipment | 78 |
| <i>ICOM IC-R-8500 Revisited</i> | |
| Computers & Radio | 80 |
| <i>A Put-the-Pieces-Together Approach</i> | |
| On the Bench | 82 |
| <i>Meteor Scatter</i> | |
| MT Review | 84 |
| <i>The AudioVox/SkyFi Faceoff</i> | |
| The Gadget Guy | 86 |
| <i>Garmin's Outstanding Rino 130</i> | |
| What's New | 88 |
| View from Above | 90 |
| <i>Wx Sat Reception - Easy to Advanced</i> | |

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| | |
|-----------------------|------------------------|
| TJ "Skip" Arey | On the Ham Bands |
| Rachel Baughn | Communications |
| | Letters to the Editor |
| | What's New |
| Kevin Carey | Below 500 kHz |
| John Catalano | Computers & Radio |
| Mike Chace | Digital Digest |
| John Corby | Scanning Canada |
| Jock Elliott | The Gadget Guy |
| Marc Ellis | Radio Restorations |
| John Figliozi | Program Manager |
| | Program Spotlight |
| Bob Grove | Ask Bob |
| Lawrence Harris | View from Above |
| Glenn Hauser | Shortwave Broadcasting |
| Tomas Hood | Propagation Forecasts |
| Bob Parnass | Scanning Equipment |
| Chris Parris | The Fed Files |
| Ken Reitz | Beginners Corner |

| | |
|------------------------|---------------------------|
| Jorge Rodriguez | Monitoring and the Law |
| Idea Rogers | Boats, PLANES, and Trains |
| Clem Small | Antenna Topics |
| Robert Smathers | Satellite Services Guide |
| Doug Smith | American Bandscan |
| Hugh Stegman | Utility World |
| Gary Sturm | Boats, Planes, and TRAINS |
| Gayle Van Horn | Frequency Manager |
| | Broadcast Logs |
| | QSL Corner |
| Larry Van Horn | Milcom |
| Dan Veeneman | Scanning Report |
| Ron Walsh | BOATS, Planes and Trains |
| Gary Webbenhurst | Bright Ideas |
| George Zeller | Outer Limits |

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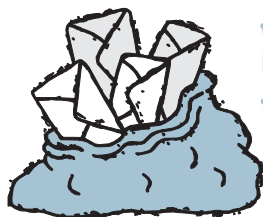
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LETTERS

TO THE EDITOR

Missing the Feds

"I am reluctantly renewing my subscription to *Monitoring Times*. Why reluctantly? Because *The Fed Files* column, THE reason why I subscribed to *MT*, has been slowly fading away. It used to appear every month, then every two months and now every four months.

"I know it isn't for lack of material since the new radios on the market make it possible to listen to trunked as well as digital systems. Also, the city profiles as well as the profiles of the components of the Dept of Homeland Security were never completed. I also know from my own casual monitoring that there is plenty to hear in the federal bands.

"While I have renewed this time, I can assure you that I will be keeping an eye on my favorite column."

— John White, Rye, NY

John, I understand your concern, and am sympathetic. I've been keeping my ear open for word from *Fed Files* readers as to whether we had reduced its frequency too drastically. Also, I'm anxious to learn of the level of enthusiasm for the new *Boats, Planes and Trains* column and whether it warrants greater frequency as well. All these columns could probably appear four times a year instead by cutting back the project/review columns.

However, I regret to say I've heard very little on any column's account. Are you readers fading away as well? Or will you come to the defense of your favorite columns and writers as John has done? Case in point: I think one of the reason the city profiles were not completed was for lack of input from folks living in the urban areas Larry had planned to cover.

There are lots of opportunities to be interactive with *Monitoring Times*. Weigh in on behalf of your favorite columns, tell us what features you'd like to see, tell us what you didn't like, send in your editorial comments for use in *Letters* or in *Closing Comments*, participate in the online Chat Board when you have late-breaking news that won't make the magazine deadline.

Of course, the most important contributions you can make are (1) buying a subscription and (2) corresponding with the columnists, providing them with material and feedback. These two activities are the best guarantee that *Monitoring Times* will continue being the vehicle for the hobby that you want it to be.

To all our faithful and passionate readers who are active and do all the above – please accept my heartfelt thanks on behalf of all the staff and our more passive readers.

Latitude vs Longitude

"I am certain that Hugh Stegman (*HF Communications*, May 2004) meant 35 degrees west *longitude* rather than 35 degrees west *latitude*. Longitude is measured east or west from the prime meridian, while latitude is measured north or south from the equator. There would be no such position as 35 degrees west latitude."

— Doug Robertson, Oxnard, CA

Oops, that mistake missed a number of eyes, Doug. Being a seasoned boater I'm sure that discrepancy jumped right out at you. Are we getting too dependent on GPS to figure it out for us, like the kids who can't make change without a calculator?! - ed.

CCRadio: The Good and the Bad

"In 1998 or so I purchased a CCRadio (no plus). It turned into a useless piece of junk ...Display went away ...audio full of hum...etc. I decided one day to complain via internet to Crane's web site. I composed a 'not a happy camper' message. Within a week, I received a response and nearly fell out of my chair. A new CCRadio Plus was on the way with a UPS pickup tag for the original radio. Now that's customer service!

"The new unit arrived and indeed was much improved. Unfortunately, the Grundig S-350 for about 60% the price absolutely blew the CCR out of the picture with respect to strong signals. There you have it, I encourage all that have purchased CCR's and are not happy to contact the very fine and honest folks at CCrane ...you will not be let down."

— KF6GNI, Novato, CA



Pictured here is the KF6GNI operating location

Ham Radio Deluxe

"I just wanted to thank you (John Catalano) for your stimulating and upbeat review of Ham Radio Deluxe software. Based on your review, I downloaded the software at

the next available opportunity. While I have only had the chance to play with the basic features, I at least got the SWL database up and working and took a peek at the PSK31 module. All I can say is wow! The thing that strikes me the most is the interface's ease of use.

"I have Ham Radio Deluxe set up with my Icom 746 transceiver, I only wish that I could use the software with my Drake R8B."

— Chuck Bridges, AK6DV

Local Laws

The June *Monitoring and the Law* was "another excellent column. Regarding your comment that readers should research their local statutes and codes using keyword searches to uncover local radio laws, you did not include another great resource in your otherwise extensive list of websites.

"<http://www.municode.com> has almost every local code online, all for free, and searchable by jurisdiction name. I use this site on a regular basis to download code excerpts for use on my traffic engineering, land use, and zoning reports. Keyword searches are easily accomplished to quickly identify code passages containing words such as 'radio,' 'scanner,' 'receiver,' 'channel,' 'reception,' or any other word that may be used for the purpose of describing or regulating radio transmissions."

— Robert Wyman, Miami, FL

Trivia Time Below 500 kHz



"In answer to the *Below 500 kHz* trivia question (June issue) ...On or about Aug 5, 1963, WWVL became operational, and began transmitting a 500 W signal on 20 kHz. The WWVL broadcast was discontinued in July 1972.

"WWVB uses two identical antennas that were originally constructed in 1962, and refurbished in 1999. The north antenna was originally built for the WWVL 20 kHz broadcast (discontinued in 1972), and the south antenna was built for the WWVB 60 kHz broadcast.

"I have a few clocks that receive the

WWVB signal here. ... I work with emergency service as a volunteer, I also am a member of Michigan DMAT as a communication person."

— *Gerry Gomes WB8RNY*

"I've been reading *MT* for a few years now and have enjoyed your articles. In the June issue you posed a few questions regarding WWVL. I think that the answers are:

1. The transmit frequency was 20kHz.
2. WWVL was on the air from August 1963 to July 1972.
3. The north antenna used by WWVL was incorporated into the WWVB operation.

"I've been a big fan of WWV and have made extensive use of it in the past."

— *Ed Walsh*

Geocaching

In step with our cover feature on GPS applications is the following plug by David Herberger on the subject of Geocaching:

Geocaching has become a popular sport in over 200 countries. This sport of hide and seek reminds me of a simpler time when someone would count to 20 and everyone would hide. Geocaching is an entertaining way to use the capability

of a Global Positioning System (GPS) receiver; take the family and friends out for a day of scavenger hunting.

Some people may ask, "What is a GPS receiver?" Basically, a GPS radio calculates the distance of the receiver from several satellites, and thereby can pinpoint the position of the receiver very precisely.

There are many GPS units to compare. Some have maps and some are voice activated. You can just go into an electronics store and ask around for the device that fits you. You want a unit that can pinpoint the location of a cache within 10 feet.

The rules of geocaching are fairly simple. First you find the coordinates of a cache near you, generally by doing a search on the computer for geocaching. When you find the cache, take an item from it and leave an item and jot down what you find in a logbook.

People from near and far are diving into this latest craze. You can do it alone or with a group. Everybody is sure to have fun. And next time you're at the electronics store feel free to ask the guys behind the counter how GPS works. And dare to compare to get your best deal.

Bellingham Museum

This month we highlighted a unique little museum in Reno, Nevada. Several readers have called our attention to another remarkable museum of radio. Some time ago Bill Hochstatter of Colfax, Washington, sent a news clipping about the American Museum of Radio in Bellingham and suggested that anyone thinking of taking a cruise to Alaska might want to stop there. Bellingham is two hours north of Seattle or one hour south of Vancouver, BC — both ports of departure for Alaskan cruises.

The museum has an ambitious vision to be the best at presenting the relationship between early investigations into the phenomenon of electricity and the subsequent development of radio. Eventually the museum will expand into eleven galleries demonstrating three centuries of scientific achievement, with many interactive exhibits. (<http://www.antique-radio.org> or call 360-738-3886)

We welcome your ideas, opinions, corrections, and additions in this column. Please mail to **Letters to the Editor**, 7540 Highway 64 West, Brasstown, NC 28902, or email editor@monitoringtimes.com. Letters may be edited for length and clarity.

Happy monitoring!

—*Rachel Baughn, KE4OPD, editor*

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RX-350D

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Radio Hobbyist's Pranks Result in Federal Conviction and Prison Term Under the Patriot Act

Last May U.S. District Judge John Shabaz sentenced a former University of Wisconsin student to eight years in federal prison for interfering with the radio frequencies of the Madison, Wisconsin, Police Department from January to November of last year. Rajib Mitra was also ordered to complete three years of probation and to pay over \$6,000 in restitution to the Madison Police Department.

Chris Van Wagner, Mitra's attorney, had argued that the harsher penalties under the revised federal sentencing guidelines that took effect at midnight on November 1, 2003 – one day after some of the most significant interferences in the case and the date of the earliest charged offense – were drafted to punish domestic terrorists, not college students like Mitra. Judge Shabaz also increased the sentence for what he believed was Mitra's lying in court.

Mitra was indicted by a Grand Jury in November of 2003 on two counts of committing computer crimes on October 31 and November 1, 2003. Specifically, he was charged with knowingly causing a transmission to a protected computer, the Madison Emergency Radio system, a Motorola Smartnet II trunked radio system, and that as result of his conduct he intentionally caused damage which affected a computer system and/or resulted in a threat to public safety in violation of Title 18 United States Code, Section 1030, et seq.

Although the case was investigated for months by the local authorities, it was the federal government that stepped in after an arrest was made to take credit for the case. FBI agents were only assigned after Madison Police Detective Cynthia Murphy, who was the lead investigator on the radio interference case, obtained enough evidence to get a search warrant for Mitra's apartment.

Then in an unusual move for a criminal case, one month before the trial began, Motorola intervened and sought to keep both their employees' and Mitra's testimony secret. Mitra's attorney argued successfully that such a move would deny his client a right to a fair and public trial guaranteed by the Constitution. It would also prejudice the jury against his client, Van Wagner argued. In a motion filed in federal court, Motorola asked the Judge to close the public portions of tes-

timony in the case. As in the government's case, the motion seemed to be supported by fears of terrorism, although Motorola's spokesman Steve Gorecki was quoted as saying that Motorola was seeking to protect its technology and he discounted the link to terrorism.

Motorola argued in its brief in support of the motion to close the proceedings to the public that "[A]ccess to the confidential information sought by the United States in this action will enable would-be copycats, hackers and even terrorists to access and disable the communications systems used by more than 8,000 first responder systems worldwide, including the city of Madison Police Department."

Testimony by Mitra and several Motorola employees could disclose sensitive information that could be used by others to "endanger public safety and risk the lives of law enforcement officers," Motorola went on to say. The company also expressed concerns that the testimony would disclose proprietary trade secrets. Disclosure of technical information about the Motorola radio system would place the company "at a distinct competitive disadvantage," a Motorola systems engineer wrote to the court.

"While Motorola has developed proprietary systems to ensure the security and confidentiality of radio systems, such as the Smartlink II ..., these systems unfortunately are not completely impervious to disruption or monitoring by determined hackers," Motorola said. Motorola was concerned that if others learn how Mitra disrupted the radio system, "it is clear that large-scale chaos could quickly ensue, given the widespread use of such systems by first responders."

A federal jury found Mitra guilty in March of interfering with emergency communications last Halloween in Madison, Wisconsin. At his sentencing, Judge Shabaz said the government's evidence showed Mitra also caused 20-30 instances of interference on over a dozen dates starting in January 2003. In calculating Mitra's sentence, the judge ruled that the police communication system here qualified as "a critical infrastructure" under the new guidelines, an issue that the jury may have wrestled with, in light of questions they posed during their more than six hours of deliberations.

❖ Critical Infrastructure Defined

The issue of whether the police radio system was a critical infrastructure and whether the interference by Mitra was intentional and substantial both are to be appealed to the U.S. Seventh Circuit in these first interpretations of certain provisions of the Patriot Act. Mitra's appeal is being handled by attorney Lew Wasserman.

During the trial, Assistant U.S. Attorney Tim O'Shea labeled Mitra a "domestic terrorist" because of the attack's target – the Madison Police Department – and the number of attacks. Mitra knocked out police radio transmissions, O'Shea said, by broadcasting a tone on Oct. 31 and Nov. 1 of last year on the trunked radio system's control channels. He also broadcast sex sound clips that the government said he had found and downloaded from the Internet. On November 11th local police tracked the interference to the city block that Mitra's apartment was in and arrested him a few days later.

At trial, Mitra testified the Nov. 11 transmissions had to have been accidental transmissions that occurred when two wires rubbed against themselves in the radio. The sex sounds, he explained were broadcast because he was listening to them over and over in his apartment. When he heard those same sounds on his police scanner, he realized what had happened and threw his Motorola radio away.

O'Shea disputed the testimony that the transmissions were unintended consequences of trying to modify and program a radio that would monitor the Madison Police's 800 megahertz trunked radio system. Mitra could have used a scanner to listen to the police radios, but instead he bought a Motorola radio capable of transmitting. At sentencing Judge Shabaz called the Mitra's testimony "a fairy tale" that the jury did not believe.

Disclaimer

Information in this column is provided for its news and educational content only. Nothing here should be construed as giving specific legal advice. Persons desiring legal advice about their specific situation should consult an attorney license in their jurisdiction.

G3 WINRADIO g313i

Introducing a breakthrough

Just when you thought that there is nothing new in radios, along comes the new WINRADIO G313i software-defined shortwave receiver!

This new, low-cost receiver inaugurates the third generation of wide-band, PC-based receiving equipment from WINRADIO. It is the first commercially-available receiver where the final IF stage, as well as the all-mode demodulator, are entirely executed in software, controlled by your personal computer.

While the Standard Demodulator of the G303i provides the level of performance of a quality shortwave receiver—including synchronous AM demodulation and a real-time spectrum scope—the optional Professional Demodulator of the G303i-P offers continuous IF filter bandwidth adjustment, interactive block diagrams, two additional audio spectrum scopes, and even inbuilt THD and SINAD measurement facilities. Additional software upgrades, including a Digital Radio Mondiale (DRM) demodulator, will be available soon!

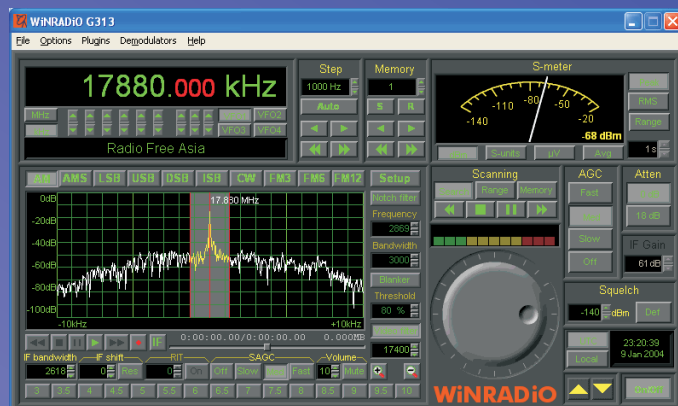
Now! All the features of the top-rated G303i, plus:

- ✓ IF shift
- ✓ Notch filter
- ✓ Noise blanker
- ✓ Internal DSP (no sound card required) AFC
- ✓ Audio and IF recorder/playback
- ✓ Audio spectrum analyzer
- ✓ Frequency accuracy measurement
- ✓ 0.5 ppm frequency stability
- ...and much more!



What's included?

The standard WR-G313i package includes:
 WR-G313i receiver card
 Application software
 Comprehensive user's manual
 Start-up antleadenna
 Audio
 BNC-to-SMA adapter



| | | | |
|----------------------------|---|---------------|-----------|
| Receiver type | DDS-based dual-conversion superheterodyne with software-defined DSP-based last IF stage and demodulator | | |
| Frequency range | 9 kHz - 30 MHz (optionally 9 kHz - 180 MHz) | | |
| Tuning resolution | 1 Hz | | |
| Mode | AM, AMS, LSB, USB, DSB, ISB, CW, FM | | |
| Image/Spurious Rejection | 80 dB | | |
| IP3 | +8 dBm @ 20kHz | | |
| MDS | -135 dBm | | |
| Phase noise | -148 dBc/Hz @ 100 kHz | | |
| RSSI accuracy | 2 dB | | |
| RSSI sensitivity | 0.1 µV | | |
| Bandwidth | 1 - 15000 Hz (adjustable in 1 Hz steps) | | |
| Scanning speed | 40 channels/s | | |
| Sensitivity | Mode | 0.009-0.1 MHz | 0.1-2 MHz |
| (AM/SSB/CW 10dB S/N) | AM, AMS, ISB, DSB | 2.0µV | 0.25µV |
| | LSB, USB | 1.0µV | 0.7µV |
| | CW | 0.5µV | 0.2µV |
| | FM | 2.2µV | 0.4µV |
| Intermediate frequencies | | | |
| IF1: 45 MHz IF2: 12 kHz | | | |
| Frequency stability | | | |
| 2 ppm (0 to 60° C) | | | |
| Antenna input | | | |
| 50 ohm (SMA connector) | | | |
| Output | | | |
| 600 ohm line audio | | | |
| Form factor | | | |
| 2/3 length PCI card | | | |
| Interface | | | |
| PCI 2.2 compliant | | | |
| Dimensions | Length: 195 mm (7.68") (excluding mounting bracket) | | |
| | Height: 99 mm (3.90") (excluding edge connector) | | |
| | Thickness: 19 mm (0.75") (incl. components on either side) | | |
| | | | |
| Weight | 330 g (11.6 oz) | | |

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NEW TECHNOLOGY

GPS - An Idea Whose Time Has Come

Although interest in Global Positioning Satellite technology has been widespread, apparently it hasn't generated the kind of numbers that excite manufacturers until recently. Expansion of the market is largely due to the FCC's requirement that by the end of 2005 a cellphone must be able to identify its location when used to dial 911 in an emergency. The increased production has stimulated the development of GPS-on-a-chip and has lowered production costs, making GPS affordable for other consumer applications.

Tracking is one of the things GPS does best. Vehicle tracking is widely used by trucking companies, taxi, ambulance, and public safety dispatchers to ensure efficient use and safety of their fleets. Boats, planes – anything that moves is a potential user of GPS.

The technology is beginning to be used for keeping tabs on individuals as well, such as Alzheimers patients; prisoners on work release, half-way houses or in-home confinement; and even children and pets. This application is more problematic, however, since GPS does not work as well within buildings or in heavy foliage.

Companies such as the Sendero Group and Pulse Data HumanWare are working on applications to help the blind to negotiate their surroundings using verbal directions based on GPS plus street mapping software and their own personalized waypoints.

BROADCASTING

WSHB Sold to LeSEA

The First Church of Christ, Scientist, in Boston, Massachusetts, announced the impending sale of its shortwave station, WSHB, South Carolina, to LeSEA Broadcasting Corp., an Indiana-based broadcaster specializing in non-denominational Christian programming. The sale will take place once the FCC has completed its review of the agreement. The sale price will be \$2 million. LeSEA apparently plans to keep on much of WSHB's current engineering staff.

NASB Elects New President

The National Association of Shortwave Broadcasters (NASB) elected Doug Garlinger as the new president of the Association. Doug is the former Director of Engineering for LeSEA Broadcasting, which owns shortwave stations WHRA, WHRI and KWHR (and now WSHB). Just a few months ago, he left LeSEA to take an engineering position in Hawaii.

Outgoing NASB President Jeff White commented: "The NASB could not be in better hands. Besides having been a shortwave listener himself since he was a child, Doug is one of the most recognized broadcast engineers in the United States, with many awards

to prove it."

Jeff White has been elected Chairman over the new USA DRM Group – organized to promote the development of DRM (digital shortwave) in the United States. The NASB agreed to extend the Voice of the NASB DRM broadcast series.

Support Local Radio for America

In 2000 Congress authorized "low-power FM stations" to serve highly localized communities. However, the National Association of Broadcasters (NAB) was successful in getting Congress to impose limits on the licensing, claiming potential interference to existing FM stations. Sens. John McCain (R-Ariz.) and Patrick J. Leahy (D-Vt.) introduced a bill to lift these restrictions.

Nationwide, more than 200 such stations are on the air. If the McCain-Leahy bill is enacted, as many as 1,000 more could be licensed, community-radio advocates estimate. More than 3,400 community groups have applied for low-power licenses.

Both the FCC and an independent study have concluded community radio stations would not interfere with commercial stations, but the NAB claims the study is flawed.

Local Broadcasters Sweat Deadlines

Winning one of the new low power FM licenses is only the first of several hurdles posed by FCC construction deadlines. For example, low power station KDRT hopes to be broadcasting on 101.5 FM to Davis and surrounding areas in September, but was struggling to reach a \$10,000 fundraising goal by July 1st.

In Chapel Hill, North Carolina, WCOM was having trouble finding a site for its antenna. Its original plans were turned down by the FCC and it faced a July 1st deadline to be up and running.

Fort Lauderdale on the Air

Fort Lauderdale has launched its own permanent, 24-hour low power radio station. Like LPFM stations, it has about a five-mile radius, but this one doesn't have to wait for approval. It operates under the Highway Advisory Radio Station System on AM 1610, and communicates information about matters such as traffic, construction, meetings and special events.

"What we wanted to basically make sure that we do is of course cover evacuation areas," said Tim Edkin, the city's director of information technology. The messages run all day, every day, and can be changed by remote dial-in.

Local Radio in Baghdad

A story from *The Guardian* tells of Radio Dijla, broadcasting from a modest family house somewhere in a western Baghdad suburb. Unthinkable during the Saddam era, it is Iraq's first talk radio station. It is only a small

commercial channel, but has already struck a chord with residents, logging up to 18,000 callers a day.

"This is a new concept for Iraq and the Arab world, and fills a yawning gap," says Ahmad al-Rikabi, Radio Dijla's founder, who was head of the US-funded Iraqi Media Network but resigned, citing frustration at interference and bureaucracy.

"I thought I had a good idea, but I never expected this amount of interest so soon. We are already No 1 in Baghdad." Local police have asked the station to extend its programming because it has given Iraqis something to do at night.

Radio Dijla has also become required listening for the country's new authorities.

Radio Dijla broadcasts in the local Iraqi dialect and not classical Arabic, the language of authority. "We use language that can reach everybody; the doctor, the writer, the thief, the farmer, even the insurgent," Mr Rikabi says.

FCC Gets Tough

Levi Willis, Sr., of Norfolk, VA, owns or controls corporations that hold the licenses of six FM stations (and 22 AMs) in North Carolina, Mississippi, and Virginia; these licensees have entered a Consent Decree with the FCC which may save some of the licenses from cancellation. Bottom line, he will lose four stations. Doug Smith comments, "I can't ever remember anyone losing more than one license in a single action in my lifetime - though I know it has happened."

Willis' stations had been cited for a number of technical violations, which led to the levying of fines. Unpaid fines totaled more than \$85,000, not counting unpaid federal taxes or FCC regulatory fees. Willis will be required to surrender licenses of four AM stations for cancellation. Two stations will be sold and the proceeds used to pay outstanding taxes, fines, and fees. Any remaining money



July 30-Aug 1: Omaha, NE

World TV-FM DX Association annual convention, located at the Park Plaza Regency Lodge, is hosted by Matt Sittel and Michael Hawk. \$28 convention fee includes a tour of skip-magnet KMTV, technical talks, banquet, and on-site antenna and radio demos. For more information visit <http://www.amfmdx.net/WTFDA2004/>, or write Matt Sittel at mcsittel@cox.net or 15013 Eureux St, Bellevue, NE 68123.

Aug 21: Cudahy, WI

11th Annual Madison-Milwaukee Get-Together for DXers and Radio Enthusiasts at Sheridan Park in Cudahy, WI. This is an all-band event, held this year on the Lake Michigan shore in south suburban Milwaukee. The festivities begin at 1 p.m. Contact host Tim Noonan at DXing2@aol.com or 414-762-2702 for more information.

must be used to bring the unsold stations up to FCC compliance.

TELEVISION

A team of researchers representing some of the best and brightest in the field have determined that even a moderate amount of television-watching during the formative years has an adverse effect on attention span.

Maybe Dallas zookeepers should be notified of the study results; they've been entertaining bored gorillas with television. Five gorillas have been isolated from the public since an escape and attack by one of their members, but the forced separation from the public has them restless and stressed. The older gorillas show little interest in television, but the younger ones enjoy Disney cartoons and National Geographic specials.

In addition to television the staff provide games such as hiding the gorillas' food. They also play the radio; classical music mellows them out.

AMATEUR RADIO

Emergency Volunteers

Around three dozen Amateur Radio Emergency Service (ARES) volunteers arrived to help the Red Cross in its response to flooding in southwest Virginia over Memorial Day weekend. Using both VHF and HF, and erecting J-pole antennas for better signal strength out of the steep valleys, the volunteers effectively supplemented Red Cross communications.

BPL

Ed Yearly adds another website of interest to those protesting the implementation of broadband over power lines (BPL): <http://www.gobpl.com/>

FCC

Enforcement Actions

Period from mid-May to mid-June

1. Inquiry concerning multiple application filings by Nakamura, K3DJ, Buffalo, NY.
2. Dismissal of complaint against Bell County Communications Center and club license W5BEC, Texas.
3. \$10,000 forfeiture against Best Wok restaurant for operation on Amateur repeater frequencies, New Jersey.
4. Inquiry into complaint alleging malicious interference, Lugo, AB9CR, Illinois.
5. Inquiry into complaint alleging interference by SSB Sweepstakes operator, Coad, NU6S, CA.
6. Warning Notice to trucking company, unlicensed Ten Meter radio operation, Auto-Elite Transportation, NJ.
7. Letter requesting licensee to contact Enforcement Bureau regarding operation on Two Meters, Turk, K8DMT, OH.

8. Letter requesting licensee to contact Enforcement Bureau regarding operation on 27.590 MHz, Uliano, N2IYT.

9. Warning Notice regarding operation with expired license, Norgren, KD6WZG, CA.

10. Inquiry regarding complaint of control link on 147.210 MHz, Padro-Vasquez, WP4MJP, PR.

11. Inquiry regarding complaint about operation on Two Meters and an IRLP system, McCord, K5GLH, OK.

12. Notification of two year short term renewal, in settlement of enforcement issues, Schott, KA3BMS, PA.

13. Inquiry to residential owner concerning radio interference to Amateur station in Friendship, TX.

14. Inquiry to city utility regarding failure to respond in power line interference matter, Lakeland, FL.

15. Inquiry into complaint alleging malicious interference on 75 Meters: Richter, KB2SIE, NY; Shaw, K1DEU, VT.

16. Inquiry into complaint alleging malicious interference on Twenty meters: Jeswald, W4NTI, AL; Best, W7CPA, AZ.

17. Letter requesting 4 licensees to contact Enforcement Bureau regarding operation on Twenty Meters: De La Cruz, KF2C, NY; Fernandez-Camile, WP4H, PR; Vasquez, KB2UFD, NY; Sanchez, N3NRE, NJ.

SCANNING

Hi-Jacked Frequency

During the Indy-500 telecast on ABC-TV (May 30, 2004), it was reported that someone had hijacked driver Sarah Fisher's radio channel. Reportedly he kept saying, "Hey Sarah, how you doing? what's going on?" and she supposedly said "I don't know who you are, but would you please get off this channel until the race is over."

Hoaxer Pleads Guilty

A Coast Guard seaman's apprentice pled guilty to radioing a Mayday hoax in which he pretended to be two fishing vessels in need of rescue. Robert T. Tolson made the false distress call over VHF-FM radio channel 16, the international hailing and distress channel, on Dec. 12, while his San Diego-based cutter was laid over in Kodiak for supplies and fuel.

Tolson pleaded guilty to the hoax on June 3 in a special court-martial proceeding in San Diego. He was sentenced to five months in the Naval Brig at Marine Corps Air Base Miramar, after which he is to be discharged.

Communications is compiled by Editor Rachel Baughn, KE4OPD, from news stories sent in by our readers. Thanks to this month's fine reporters: Anonymous, Ed B., CE Evans, Norman Hill, Sterling Marcher, William Moore, Jerry None, Michael Reynolds, Doug Robertson, Brian Rogers, Doug Smith, Linda Spagnoli, Gayle Van Horn, Larry Van Horn, Peter Vieth, Jeff White, Robert Wyman, Ed Yearly, and George Zeller.

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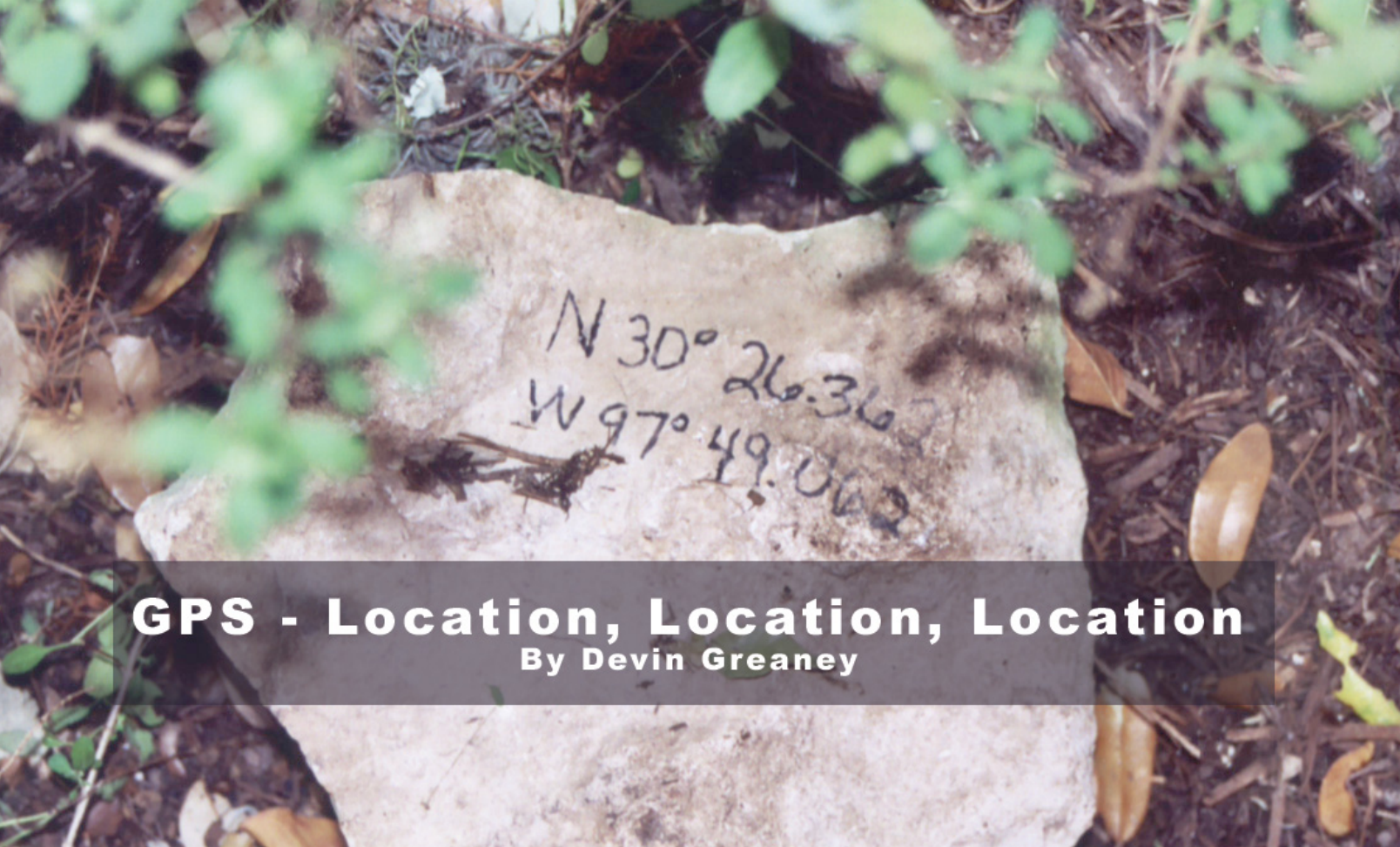
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GPS - Location, Location, Location

By Devin Greaney

Do you know where you are? Do others? Do you want them to know? Well, the ability to pinpoint your precise location is now within the grasp of anyone with a couple of hundred dollars to spare.

Twelve thousand miles above the Earth are 24 Global Positioning System (GPS) satellites that orbit the planet, sending and receiving signals. Anyone with a GPS receiver can make use of the constant signals to determine his or her speed, altitude, route and location. A handheld GPS receiver is about the size of a fat cellphone, and additional software is able to not only show the location of the receiver, but the closest Walmart, Red Lobster, etc. Some models may have a radio transmitter to pinpoint other GPS users.

Recently, GPS has become a technology that is integrating itself into many areas of daily life. Here are only a few of the many ways in which these publicly-available satellite signals are enhancing both leisure and business activities.

The Treasure Hunt

Geocaching is a new sport that puts a modern twist on the good old-fashioned treasure hunt, and GPS is what makes it possible.

Here is how it works. Someone hides a container with trinkets in a location and marks the coordinates in latitude and longitude using a GPS receiver. It is the equivalent of X marks the spot. The successful treasure

hunter who finds the box may take what he or she wishes, but geocaching etiquette says one is expected to put in other items.

Several websites have a list of geocaches, but a good place to start is <http://www.geocaching.com> to see if there is a cache near you. This reporter found a geocache listed for Austin, Texas. I plugged the coordinates of N 32.46.32 , W 97.49.306 into a Garmin E-Trek Venture. (A receiver that can be purchased at electronic or outdoors shops for \$175.00 to \$200.)

My starting point was 14.2 miles away from the cache, so an arrow on the navigation menu pointed towards the site. The arrow points to the location like a compass needle to magnetic north. First it led up Mopac, then US Highway 183. Turning on Anderson Mill, the indicator pointed down Randy Road and pointed to a dead end. The device read .52 miles away. Leaving the car, the indicator pointed down a trail. A few feet later, the trail ended.

Herein lies the difficulty, because a location may be 1 mile away, but unless you are a bird, it may require 3 miles of hiking to get there. Such was the case here. On some GPS devices a map is built into the display. If not, it helps to have a map on the journey. By drawing arrows on a city map I saw they were pointing toward Trail Head Park.

As I got closer to the park, the GPS counted down first by miles, then by fractions of miles, and then by feet until the location was reached. And there it was – a rock

with more coordinates (photo above).

These coordinates led a quarter mile to the east. All this to find a hidden metal case, and, no, it does not contain gold. Walking towards the site, the GPS pointed suddenly off the trail. There were plenty of places to hide the container.

We'll come back to that later. But first, let's look at some other popular applications for GPS.

The Hiker

Campground SE 1 at the Southeast Rim in Big Bend National Park, Texas, is a 6.28 mile hike from the trail head and amenities. The nearest city, Presidio, Texas, is 68.29 miles away.

With a back pack and an over 1,800 foot altitude gain, anyone completing the trek has left civilization. Trees, mountains, and a view that makes the grueling journey worthwhile show a country that has changed little since man first walked in these mountains thousands of years ago.

Despite leaving the twenty-first century behind, the visitor still has not left the influence of the information age. The Garmin Legend GPS which went on this excursion went beyond location to provide information that can come in handy for the outdoor adventurer. Sunrise and sunset times for any location and any day help plan the hike. There is even a way to find the best times for fishing based on the angle of the sun.

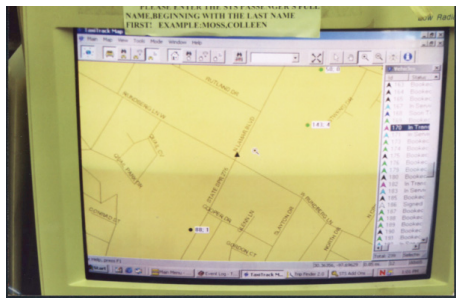
Such are some of the questions which

can be answered by the technology in your GPS receiver in between periods of enjoying the simple beauty of the great outdoors.

Hey, Taxi!

"There is no way else to do it," said American Yellow Checker Cab dispatcher Nicole Sage. "I can't imagine dispatching without it," she said looking over her screen with color coded arrows and numbers next to them. This weekday afternoon there were one hundred thirteen taxis running the streets of Greater Austin and all were within Sage's eyesight.

For the last six years, according to radio



shop manager Joe Tower, GPS has assisted the dispatch office when a customer calls to ask the status of a cab, assisting them when they need help finding someone, or, if there is trouble, pinpointing the location. Automatic Vehicle Locating (AVL), as it is called, means the dispatcher can find a cab and quickly.

A click of the mouse showed cab 170 was headed south on US Highway 183 near Techni Center. It was color coded pink, showing that it was on its way to pick up a passenger; the arrows that represented the taxi showed the direction of travel. The TaxiTrack program was taking a snapshot of the fleet's status every forty-five to sixty seconds, but it could be set to update at shorter intervals. The system was added, according to Tower, because, "It makes it better for the customer and makes us a better service provider."

"I love it," said driver Joe Hickey as he waited at Sixth and Brazos. He remembered some two and a half years earlier when an intoxicated man who was "six (foot) six (inches) tall, two hundred fifty pounds and all muscle," he said, became belligerent in his cab. Hickey hit an alarm that told dispatch where he was and within five minutes Hickey had fifteen other cabs showing up "to protect my ass," he said, followed by the Austin Police Department who removed the passenger.

Tee Time

Since the golf course opened in May 2001, golfers at Star Ranch in Hutto, Texas, have had help from outer space.

Golf carts heading up and down the course have a touch screen monitor that provides continuous feedback to and from satellites. Where is the next hole? Where is the center? What is the depth of the green? When did the game start? How much time has



Victor Villarreal shows off the Parview system

elapsed? All can be answered with the Parview system. A similar system can be ordered by subscription and fed into a golfer's personal GPS for other courses.

Distance is what determines what kind of club the golfer uses. The device measures in yards the distance from the cart to the hole. Golf pro Victor Villarreal from Star Ranch says the feature attracts golfers.

"They enjoy it and don't mind paying what they pay to come out and get this instrument," he said. The United States Golfing Association tournaments does not permit the use of GPS in its tournaments at this time, but individual tournaments often do allow its use, according to Villareal.

Golfers are not the only ones who get information on the course from the system. Back at the clubhouse, a terminal shows where the golf carts are located. It alerts the clubhouse if the carts are driving where they are not supposed to be. During our visit two golf carts were driving well off the path looking for their ball. Villarreal said the club house received an alert before he asked them to return to the cart path. If golfers are moving a little too slowly and holding up traffic, the clubhouse sends a message. "Please maintain the pace of players with the group in front," is a polite message that pops up on the screen.

In Flight

Gary Wilson of Round Rock was in the pilot's lounge at the Taylor Municipal Airport discussing his traveling companion, a Garmin 295. As a pilot, he sees GPS as a great way to get from here to there. Navigation for pilots is especially critical where there are no roads or trails, sometimes only clouds. Distance, speed, altitude and direction become more critical when one cannot stop to ask directions.

Before GPS, navigation systems such as LORAN (long range navigation) and VOR (VHF Omnidirectional Range) used radio frequencies from points across the country to guide the pilot. Traveling from city A to city F required

flying towards the radio transmitter for city B, C, D and E first, even though the direct line between the origin and destination could be shorter. Plus, the Loran signal may not be available at certain locations. However, a GPS shows a direct line (known to pilots as a vector) between the two airports. It saves fuel and time, whether it is a two seat Cessna flying from one town to the next or a Boeing 747 on the New York to London route.



Gary Wilson says flying without a GPS receiver "is just boneheaded."

Currently, the navigation help is just for the pilot or flight crew. The device does not transmit back to air traffic control. Radios referred to as transponders transmit location, speed and flight information to air traffic control so the controllers can space the aircraft in a safe manner. Many airports are adding, or have added, a GPS approach to assist pilots not only in finding the airport, but also in landing in poor visibility.

Current technology has a much higher price tag, so is generally used by major airlines and airports. Navigation without the technology "is just boneheaded. You can't get lost. Extremely safe, too," Wilson said.

A Call for Help

In 1759 British clock maker John Harrison developed the chronometer which provided a practical way to find longitude that measured distances east and west, along with latitude that measured north and south. Longitude and latitude provide the basis for GPS navigation.



Capt David Kinney, captain of fire dispatch for Dallas Police, shows how GPS pinpoints equipment and shortens response time.

John Harrison and his chronometer was probably the furthest thing from the mind of a guest at a hotel on North Walton Walker in Dallas on a Monday morning when the guest started having breathing problems. An employee called 911. At Dallas Fire dispatch, the call was taken, logged in by a dispatcher



and Mr. Harrison's scientific breakthrough assisted humanity once again.

The Dallas Fire dispatch system constantly monitors all of its vehicles and what they doing (on a call, at the station, moving, stationary, etc.) and the computer-assisted dispatch system automatically estimated the travel time of area units and assigned the closest ones. In this case it was engine 30 and rescue 35.

In the world of public safety, it is important to keep an eye on the fleet. On the big screens in the Dallas City Hall, fire dispatchers can get a quick overview of the fire stations; the smaller screens show the units color coded. When the firefighters are called, the image changes. The dots turn into an icon of a fire truck (the type that would have been running Dallas streets in the 1930s) on the road, the screen blinks about every fifteen seconds and the little fire truck moves a bit further down the road to the patient's location. It is rather entertaining to watch.

Dallas Police also are also equipped with GPS. Captain David Kinney, Captain of fire dispatch, remembered a traffic accident at a clover-leaf intersection. Fire units found the wreck, so they were able to direct police to the exact location using GPS coordinates. Lieutenant John Kincaid, acting Section Chief in charge of communications, remembered a large fire at an old mansion with several responders. The commander on the scene could call dispatch to find the exact location of the different engines. Another time someone stole an ambulance, but with GPS there was no hiding from the authorities.

The dispatcher now is there to "baby-sit the system to be sure it is operating cor-

rectly," Kincaid said. "We have to deal with the exceptions," he said. In case of a system failure "we have to fall back on a certain manual level of dispatch," Kincaid added. As older dispatchers who remember the pre-automated days leave the service, newer ones are there to take their place. "As dispatchers leave, experience goes with them. You can train them but you can't give them experience," according to Kincaid.

Chasing the Wind

Those who travel as part of their jobs find the GPS an asset for finding addresses, places to eat and lodging. The Garmin Streetpilot is one that, used with MapSource software, has maps down to the street level and points of interest designed for someone in unfamiliar territory. A bit larger, more expensive (it retails for about \$1000), and more detailed than some of the others, this is designed for the car or in some cases the boat. But for Jeff Draper of Cedar Park, his traveling needs are bit different.



Draper's in-vehicle installation

Draper is the founder and team leader of Texas Severe Storms Intercept, a group of storm chasers who no longer need to drive through Tornado Alley while trying to interpret the map book spread across their laps.

Draper founded the group in 1993 and has had a GPS as one of his chase partners since about 2000. "It's helpful when we get off the beaten path where we are not familiar," he said. This is something almost everyone can relate to at one time or another, but with a tornado thrown into the equation, GPS seems almost a necessity for any chase vehicle for safety as well as convenience. "The biggest thing is to pick your escape route. If it (the tornado) gets too close, you have your way out," he said.

The Dark Side

So GPS can give someone his or her location in all areas be they in Midtown Manhattan or Antarctica. It can help find hidden objects. The technology can follow someone at work or at play on the ground, on the water or in the air, and, in some cases, can give government agencies access to one's location. Is its versatility also a danger?

Imagine a science fiction movie set in the future with a warm, fuzzy advertisement showing a cute, smiling child wearing a tracking device while mom has a bigger smile knowing her daughter is safe and secure in case a kidnapper decides to prey on her.



Can GPS lead to privacy invasion without your knowledge?

Or instead of imagining, just look at <http://www.digitalangel.com>, from Applied Digital Solutions. *World Net Daily* reported in May of 2003 the company announced they had successfully tested an implantable GPS device for humans. Is it a life-saving device to watch children who may get lost or to keep tabs on an elderly relative who may become suddenly ill or an Alzheimer's patient who may wander off? Or is it a high tech version of the number tattoo used by the Nazis to track concentration camp inmates?

John Schwartz in the December 29, 2003, *New York Times* listed several incidents in which the use of GPS may make privacy advocates feel a bit uncomfortable. Federal authorities demanded a company attach a



Storm-chaser Jeff Draper studies the clouds.

wiretap to a GPS transmitter already installed in a vehicle, but the court refused to issue the warrant. A man in Wisconsin was arrested after installing a GPS transmitter in his ex-girlfriend's car to stalk her. A rental car company fined a customer \$150 for speeding, thanks to information provided to the company by a GPS device. Progressive Insurance has tested the use of GPS in cars to monitor usage and adjust car insurance rates based on the data. In February 2004, the judge in the Laci Peterson murder trial in California permitted records from the GPS system in her husband's SUV to be used by the prosecution.

In a free society, with or without GPS, there is always a balancing act between protection and freedom. Everyone wants a police officer in the area if they are followed in a dark parking lot by a suspicious character. But even the most careful and honest driver with no warrants or criminal record becomes nervous seeing a police car directly in the rear view mirror.

Police officers themselves are ambivalent. One police officer from a large city expressed reluctance to this reporter about having GPS installed in her patrol car. She said her city was considering GPS and had tried it in a few vehicles. She said it would be the same as having a supervisor riding with her at all times.

Those who think such data gathering will become commonplace cannot be written off as simply "paranoid." Do you remember

when Social Security cards had printed on the front that the social security number was to be used for Social Security information only? That line is long gone from the card, but today it could say something like "For applying for a credit card, loan, cell phone, bank account, job, college class, driver's license, making an investment, claiming a deduction on federal income tax and social security purposes only." Will GPS data be so used in the future?

GPS is not the end of privacy. GPS devices cannot do everything. In places out of the range of satellites such as tunnels or buildings the devices cannot communicate with the satellites. Also, most uses for GPS are voluntary, and the public can still decide at this point how much security and/or privacy it wants. For example, it's still your option whether you purchase a cellphone with built-in GPS so you can be located if you have to make an emergency 911 call.

As GPS-on-a-chip becomes more integrated with other new technologies, the consumer will have to balance for himself the trade-offs between potential loss of privacy and the latest evolution in security, communications, recreation, and even amateur radio.

Back to that geocache.... After walking in the dark with a flashlight over boulders, through junipers and live oak trees, down into ferns, vines and a creek, there was not a sign of the box anywhere. It will stay hidden for now.

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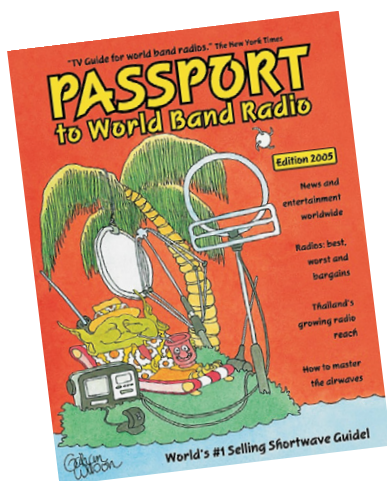
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The Birth of the Radio Networks

By Marc F. Ellis

Those of us who are old enough remember the days of radio “chain broadcasting” can still raise a goosebump or two at the thought of the network announcer, his smooth voice heavy with importance, intoning such phrases as “This is the National Broadcasting Company Blue Network” ... or maybe “This is the Columbia Broadcasting System” “presenting coast to coast” ... “from Hollywood” ... or “from Washington DC” or “from New York City’s Times Square. . .” As the announcer’s voice begins to rise with excitement, an uptempo musical background slyly creeps in behind it, then triumphantly swells to full volume for a few final bars after the name of the show to come is disclosed.

The development of the radio networks was a complex and fascinating process, intertwined with the history of radio broadcasting itself, and driven by corporate competitiveness, government regulation and individual players using vision, technical skill, political cunning and showmanship.

The Cross-Licensing Agreements

Probably the best place to begin the story of the networks is with the famous post-world-war-I radio “cross-licensing” agreements.

Then, as now, the technology of radio communication was complex enough that the manufacture of state-of-the-art gear required the use of ideas – and patents – developed by many different people. Wartime needs had stimulated significant technological breakthroughs in the radio art. But only because the government had agreed to indemnify radio manufacturers against suits for patent infringement. With the end of hostilities, that support was withdrawn and manufacturers’ hands were tied.

As just one example, there was no way for anyone to legally manufacture the all-important triode (three-element) vacuum tube. General Electric and RCA owned the rights to the diode or “Fleming Valve” function of the tube, while AT&T controlled important rights to the “grid,” or third element, invented by deForest. That impasse came to an end in July 1920, when

the companies signed the first of two agreements pooling their patents so that these vital radio components could now be manufactured legally (and under their control).

The companies also divided the radio markets between them, with AT&T gaining the use of the pooled patents for wire telephony and domestic commercial radiotelephony. G.E./RCA would concentrate on operating radio messaging services – primarily between the U.S. and overseas.

Left out of the original agreement, Westinghouse joined the patent pool the following year after some tricky behind-the-scenes maneuvering. Among the patents contributed by that firm were the valuable Armstrong regeneration and superheterodyne rights. RCA would become the marketing outlet for radios manufactured by Westinghouse and G.E.

The 1920s “Radio Craze”

But, shrewd businessmen though they were, none of the individuals who forged the cross-licensing agreements of 1920 and 1921 foresaw the explosive development that would very shortly make their assignment of marketing roles all but obsolete. That development was the public’s infatuation with radio reception that began in the early 1920s and spread like wildfire. Historians often refer to it as the “radio craze of the 1920s.”

Almost anyone with a few dollars and reasonable mechanical skills could put together at least a simple crystal set. Newspapers and magazines bulged with radio news and radio construction information. Factory-built radios were becoming more and more available. According to one industry source, the public spent \$60,000,00 on radio parts and sets in 1922; \$136,000,000 in 1923; \$358,000,00 in 1924.

Radio stations were going on the air by the hundreds – often built in garages and basements from used parts covered by patents controlled by the pool, and therefore illegal to use for commercial purposes. Many of them, with sketchy or nonexistent marketing plans, closed not long after they had opened. Since radio broadcasting wasn’t seen, at first, as a major money making

enterprise, the companies in the patent pool weren’t originally overly worried about enforcement. Nor were any concerned that they themselves might be violating the pool agreement if they set up broadcast stations.

Setting up a radio station then was done with the same motivation many had (and some still have) for setting up a web site at the beginning of the internet boom. It was done for prestige, or to get one’s name before the public, or just for vanity. Not too many people had figured out a way to make money out of it. G.E., RCA and Westinghouse, the manufacturing and marketing members of the patent pool, saw at least an indirect benefit from operating radio stations; the more radio programs that were out there be heard, the greater was the potential for selling radio sets.

Serious Broadcasting Begins

Westinghouse moved very aggressively into the broadcasting arena. By the end of 1920, it had established station KDKA (Pittsburgh), well-known for its pioneering coverage of the Harding-Cox election returns of that year. During the following year, two additional broadcast outlets were established: WBZ in Springfield, Mass., and WJZ in Newark, NJ. Later, KYW was established in Chicago.

RCA opened the short-lived WDY (Roselle Park, NJ) in 1921, but soon closed it in favor of a partnership in Westinghouse’s technically much better WJZ. A little later, RCA assumed control of WJZ and opened both another New York area outlet (WJY) and WRC in Washington, DC. G.E.’s first station, the well-engineered WGY, went on the air from the Company’s Schenectady, NY, plant in 1922. Boasting 1500 watts, it was high-powered for the era. Later, the company opened stations in Denver (KOA) and Oakland, CA (KGO).

During this period, the stations of the radio manufacturers had no direct income. Their operations were probably funded from advertising or marketing budgets. Having no sets to sell, AT&T was not vitally interested in radio *per se*. Its biggest immediate benefit from the pool was probably to gain access to legal triode



AT&T employees entertain during one of WBAY's first broadcasts. AT&T Photo.

tubes for use in the repeating amplifiers that made its long-distance wire circuits practical.

However, the firm did take advantage of its rights under the agreement to establish a radio link that made it possible to offer telephone service to Catalina Island off the California coast. Moreover, AT&T believed that it should get involved in radio broadcasting, at least as an experiment, in case the medium had the potential to compete in some way with wire telephony.

After a false start in July 1922 with station WBAY, which had a poorly-located transmitter, AT&T went on the air a month later with station WEAf. The replacement station used an efficient transmitter already located at the Western Electric building in lower Manhattan. Network operation was in the business plan from the very beginning. The New York station was to be linked, eventually, to thirty-eight other AT&T-owned stations using the Company's long lines.

Actually, networking was far from a novel idea for the Company. In an impressive 1921 demonstration, AT&T had used long-distance telephone lines, coupled to special amplifiers and loudspeakers, to "broadcast" the burial services for the Unknown Soldier from Arlington National Cemetery in Virginia to large audiences in New York City's Madison Square Garden and San Francisco's Civic Auditorium.

AT&T Introduces the Profit Motive

Since AT&T was neither in the consumer radio receiver business nor in need of flashy initiatives to enhance its public image, the Company desired to put the new broadcasting operations on a sound financial basis. It came up with a plan that might sound quaint today, but was certainly one of the first serious ideas to be implemented for the organized sale of radio time.

AT&T would not originate or provide any radio programs of its own. Instead it would offer a service called "toll broadcasting." Just as you would make a "toll call" (as connections beyond the "free" local ones were then identified) to speak with a person in another city,

you would pay AT&T a toll for the use of its facilities to broadcast a message to the audience reached by the AT&T stations. And just as with a telephone call, the content was strictly up to you.

The Company faced an uphill battle as it tried to promote the idea of selling air time. Even though WEAf had rigid rules designed to play down overt commercialism in the marketing of products and services, complaints about the immorality of "ether advertising" came from individuals, institutions and even the government.

And indeed no other stations were selling time during this period. WEAf stuck to its guns in this matter, but soon had to back down from its policy of not providing programs of its own.

The plain fact was that it was difficult to sell time if there was no proven listening audience. Conversely there was simply no inducement for anyone to listen if nobody was buying time. The pump had to be primed, and WEAf hired a Program Director almost immediately after broadcasting began.

A few months later, the station was transferred from the control of the very telephone-oriented long lines department to the "By-Products Services" department, whose director had a more aggressive marketing background. At the same time a new sales team was hired. New, more comfortable studios were built better to attract performing talent. Slowly but surely, revenues improved.

However, another compromise had to be made in the wholly-owned network broadcasting idea. For one thing, the radio spectrum was already becoming so congested that it was difficult to obtain licenses for new stations in the areas where they would be needed. To get the required coverage, AT&T would now offer network affiliation to strategically-located non-owned stations with which it at least had license agreements. Apparently, the only other station actually built and owned by the Company was WCAP in Washington, DC. But by the end of 1924, WEAf was the flagship station of a coast-to-coast network comprising twenty-six stations.

The Turf Wars

With the promise of increased profits from its improved management of WEAf and continued expansion of the national "radio craze," AT&T began to play legal hardball with the radio broadcasting community, including its patent-pool associates. The Company claimed that the contractual language which had given it the sole right to offer domestic telephony for hire applied to radio broadcasting just as much as it did such operations such as the Catalina Island radio link. Therefore AT&T alone had

the right to offer radio time for sale.

The Company also claimed that the same agreements gave it, and its Western Electric subsidiary, the sole right to manufacture radio transmitters for broadcast use as well as to interconnect stations by wire for network broadcasting. They began to speak of levying license fees from other stations for the use of non-W.E. transmitters and for the right to broadcast at all. The Company was actually successful in collecting some of these fees, though these actions didn't exactly help its public image.

Nevertheless, AT&T began to refuse to supply lines to noncompliant stations – forcing those who needed hookups for networking or remote pickup to use inferior telegraph lines not designed for voice or music transmission. Programs fed through such connections were apt to be plagued with static, odd buzzes and very poor audio quality. Even stations that were perfectly willing to purchase Western Electric transmitters found themselves facing unexplained delays in delivery schedules if AT&T did not approve of their operations.

In one well-known case, when New York City desired to establish a municipal radio station, the Company successfully stonewalled all of its attempts to buy a new Western electric transmitter – also announcing that it would not supply telephone lines to such a station. AT&T felt that the city should buy time on WEAf to air its programs. But WNYC was finally established after the city managed to import a used Western Electric transmitter from Brazil.

AT&T now touched off a firestorm among the patent partners when it became clear that the Company also felt that it had the right to manufacture radio sets. Fierce legal battles, including an unsuccessful arbitration, began to take place between AT&T and the "radio members" of the patent pool. These issues were settled in 1926, with David Sarnoff of RCA assuming a key role in the negotiations. The patent pool agreements were now rewritten so that they more realistically dealt with the emerging field of radio broadcasting.

Among the key points in the agreement were that the radio stations of all patent pool members (including AT&T's WEAf) would be combined into a single broadcasting company owned jointly by RCA (50%), General Electric (30%) and Westinghouse (20%). The new organization would, most likely, begin selling air time along the lines pioneered by the telephone company. AT&T would leave the broadcast business, shutting down station WCAP. The Company would receive one million dollars in payment for WEAf's physical facilities (worth \$200,000), the station's clear operating channel, and "goodwill."

AT&T would have limited rights (actually never used) to manufacture radio sets. But most importantly, they would be given the network interconnect business of the new broadcasting entity, providing the telephone lines needed for networking and remote pickups under a long-term contract. The Company could anticipate an income of about \$800,000 for the first year of operation. This would go up considerably, of course, as the network was further expanded.

Announcing the National Broadcasting Company, Inc.

National radio broadcasting with better programs permanently assured by this important action of the Radio Corporation of America in the interest of the listening public

THE RADIO CORPORATION OF AMERICA is the largest distributor of radio receiving sets in the world. It handles the entire output in this field of the Westinghouse and General Electric factories. It does not say this boastfully. It does not say it with apology. It says it for the purpose of making clear the fact that it is more largely interested, more selflessly interested, if you please, in the best possible broadcasting in the United States than anyone else.

Radio for 26,000,000 Homes
The market for receiving sets in the future will be determined largely by the quantity and quality of the programs broadcast. We say quantity because they must be diversified enough so that some of them will appeal to all possible listeners.

We say quality because each program must be the best of its kind. If that ideal were to be reached, no home in the United States could afford to be without a radio receiving set.

Today the best available statistics indicate that 5,000,000 homes are equipped, and 21,000,000 homes remain to be supplied. Radio receiving sets of the best reproductive quality should be made available for all, and we hope to make them cheap enough so that all can buy.

The day has gone by when the radio receiving set is a plaything. It must now be an instrument of service.

WEAF Purchased for \$1,000,000

The Radio Corporation of America, therefore, is interested, just as the public is, in having the most adequate program broadcast. It is interested, as the public is, in having them comprehensive and free from discrimination.

Any use of radio transmission which causes the public to feel that the quality of the programs is not the highest, that the use of radio is not the best and best use in the public interest, that it is used for political advantage or selfish power, will be detrimental to the public interest in radio, and therefore to the Radio Corporation of America.

To insure, therefore, the development of this great service, the Radio Corporation of

America has purchased for one million dollars station WEAF from the American Telephone and Telegraph Company, that company having decided to retire from the broadcasting business.

The Radio Corporation of America will assume active control of that station on November 15.

National Broadcasting Company Organized
The Radio Corporation of America has decided to incorporate that station, which has achieved such a deservedly high reputation for the quality and character of its programs, under the name of the National Broadcasting Company, Inc.

The Purpose of the New Company
The purpose of that company will be to provide the best program available for broadcast in the United States.

The National Broadcasting Company will not only broadcast these programs through station WEAF, but it will make them available to other broadcasting stations throughout the country so far as it may be practicable to do so, and they may desire to take them.

It is hoped that arrangements may be made so that every event of national importance may be broadcast widely throughout the United States.

No Monopoly of the Air
The Radio Corporation of America is not in any sense seeking a monopoly of the air. That would be a liability rather than an asset. It is seeking, however, to provide machinery which will insure a national distribution of national programs, and a wider distribution of programs of the highest quality.

If other will engage in this business the Radio Corporation of America will welcome their action, whether it be cooperative or competitive.

If other radio manufacturing companies, competitors of the Radio Corporation of America, wish to use the facilities of the National Broadcasting Company for the purpose of making known to the public their receiving sets, they may do so on the same terms as accorded to other clients.

The necessity of providing adequate broad-

casting is apparent. The problem of finding the best means of doing it is yet experimental. The Radio Corporation of America is making this experiment in the interest of the art and the betterment of the industry.

A Public Advisory Council
In order that the National Broadcasting Company may be advised as to the best type of program, that discrimination may be avoided, that the public may be assured that the broadcasting is being done in the fairest and best way, always allowing for human frailties and human performance, it has created an Advisory Council, composed of twelve members, to be chosen as representative of various shades of public opinion, which will from time to time give it the benefit of their judgment and suggestion. The members of this Council will be announced as soon as their acceptance shall have been obtained.

M. H. Aylesworth to be President
The President of the new National Broadcasting Company will be M. H. Aylesworth, for many years Managing Director of the National Electric Light Association. He will perform the executive and administrative duties of the corporation.

Mr. Aylesworth, while not hitherto identified with the radio industry or broadcasting, has had public experience as Chairman of the Colorado Public Utilities Commission, and, through his work with the association which represents the electrical industry, has a broad understanding of the technical problems which measure the pace of broadcasting.

One of his major responsibilities will be to see that the operations of the National Broadcasting Company reflect enlightened public opinion, which expresses itself so promptly the morning after any voice of taste or judgment or departure from fair play.

It is well known that in recommending the National Broadcasting Company to the people of the United States.

It will need the help of all listeners. It will make mistakes. If the public will make known its views to the officials of the company from time to time, we are confident that the new broadcasting company will be an instrument of great public service.

with programs originating at WEAF and the "Blue Network," with programs originating at WJZ. The story goes that the networks got their names from the colors used by AT&T and NBC engineers to sketch out the telephone circuit pathways for interconnecting the two radio groups. These networks grew rapidly, and the programs broadcast over them grew in quality and variety.

Because of the deep pockets of its owners, NBC had the money to do things right. New studios, not merely state-of-the-art but "cutting edge," were built at a Fifth Avenue, New York City location. Constructed on springs to dampen noise pick up, they incorporated newly designed equipment for the creative control and recording of sound. And the dramatic, musical and news programs we associate with the "golden age of radio" began to be produced and aired.

CBS is Born

The first stirrings of what was to become a competitive network were begun in 1927 by a well-respected artist's manager named Arthur Judson and his associate, promoter George A. Coats. They had formed a company to develop radio programs based on the word of David Sarnoff, who had led Judson to believe that

he would become a supplier of programs and artists for NBC. When this did not come to pass, Judson decided to explore the formation of his own radio network.

Judson linked up with some highly-motivated partners and formed "The United Independent Broadcasters." By offering quality programs and generous financial terms, they quickly signed up a dozen stations, including New York's WOR — which was to become the network origination point. When AT&T began to drag its feet regarding the supplying of telephone lines, associate Coates went to Washington — where important radio legislation containing strong antimonopolistic language (The Radio Act of 1927) was being crafted. Suddenly AT&T decided to play ball.

But the Judson group really didn't want to run a network. They wanted to become a supplier of artists and programs as originally planned. Eventually they interested the Columbia Phonograph Company into taking over network operations and supplying necessary cash. Columbia's business was in a slump because of competition from broadcasting and its rival, Victor Records, was being purchased by NBC. So Columbia was motivated to follow suit in establishing a similar connection. "The United Independent Broadcasters" now became "The Columbia Phonograph Broadcasting Company."

Overcoming difficult technical problems (WOR's new studio and control room facilities were only partly completed), the new broadcasters debuted their network with some very ambitious concert and operatic programs. But they were still a hand-to-mouth organization and were only able to pay salaries and line charges through "nick of time" investments by backer/friends. Soon Columbia records pulled out.

But another nick-of-time rescue was arranged through the owners of WCAU in Philadelphia, which was the network's original affiliate. A new investment group was put together and the organization was renamed "The Columbia Broadcasting System." When financial problems continued to mount alarmingly, the investors looked for a person to go to New York and assume the presidency of the network.

This turned out to be William S. Paley, an ambitious young man who was an executive in a cigar company owned by his family. An early network sponsor, Paley's company had enjoyed spectacular results from its advertising and become convinced of the power of radio. The rest is history. After taking command of the network in 1928, Paley built CBS into the formidable organization it is today — remaining associated with it until his death in 1990.

Mutual Broadcasting System

An interesting variant of network operation was initiated in 1934, when

RCA's 1926 announcement of the formation of The National Broadcasting Company.

NBC and its Two Networks

In September 1926, RCA announced the deal to the general public with full-page promotional advertising. The new entity, to be called "The National Broadcasting Company," would air its programs via a number of stations throughout the country, and would plan to broadcast nationwide during "every event of public importance." Only the finest programming would be produced and offered to the public. A "public advisory council" representing the "various shades of public opinion" would monitor content to make sure it was fair and non-discriminatory. And (mindful of its vulnerability to government scrutiny for monopolistic practices), NBC would make its facilities available to competitors at fair pricing.

NBC made its debut on November 15, 1926, in a breathtaking four-hour broadcast from the Waldorf-Astoria ballroom in New York City. The program included live and remote performances by stars of stage and screen, the New York Symphony, and famous dance bands at various locations. This glittering show had a "studio audience" of about 1,000 VIPs and a radio audience estimated at 12 million.

Before the end of the year, NBC had organized its radio stations into two separate networks: the "Red Network,"

his associate, promoter George A. Coats. They had formed a company to develop radio programs based on the word of David Sarnoff, who had led Judson to believe that



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Radiola 16 is one of the latest receiving sets developed in the research laboratories of General Electric, Westinghouse and the Radio Corporation of America. There are other Radiolas ranging up to \$895, but none that gives more per dollar than the compact Radiola 16.

RADIO CORPORATION OF AMERICA
RCA Radiola
MADE BY THE MAKERS OF THE KRISTOFOR
NEW YORK - CHICAGO
SAN FRANCISCO

Mid 1920s RCA ad illustrates how manufacturers used broadcasting activities to sell radio sets.

| | | | | | | | | |
|---|---|--|--|--|--|--|--|--|
| WASHINGTON KHO 0-B-N-N KOMO 0-B-N-N | N. DAKOTA WCCO 2-0-0 KSTP 0-0-N-N | MINNESOTA WTAQ 0-3-0 WECB 0-B-N-N WISN 0-3-0 WTMJ 0-B-N-N | WISCONSIN WBCN 0-3-0 WVIZ 2-3-4 WVIR 0-0-N-N WWJ 0-B-C-C | MICHIGAN WSPD 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | ONTARIO CKGW 0-0-N-N CFRB 0-3-0 | QUEBEC WBEN 0-B-0 WGR 2-3-0 WKBW 0-0-0 WHAM 0-0-N-N | NEW YORK WLBZ 1-0-0 WCSH 0-B-C-C WBZ 0-0-N-N NHWEI 0-0-0 WNAC 1-3-0 WORC 1-3-0 WATG 0-8-0 WJAR 0-B-C-C | VERMONT WVIZ 0-B-C-C WVIR 0-0-N-N WVIR 0-0-N-N WVIR 0-0-N-N |
| OREGON KGW 0-B-N-N | S. DAKOTA WNAX 0-3-0 | IOWA KOIL 2-3-0 KSCJ 0-3-0 WHO 0-B-C-C WMT 0-0-0 | ILLINOIS WIBO 0-B-N-N WMAQ 2-3-0 | INDIANA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | PENNSYLVANIA KDKA 0-0-N-N WCAE 0-B-C-C WIAS 0-3-0 WLBW 0-3-0 WCAU 1-3-4 WFI 0-B-C-C | MARYLAND WVIZ 0-B-C-C WVIR 0-0-N-N WVIR 0-0-N-N WVIR 0-0-N-N | MASSACHUSETTS WVIZ 0-B-C-C WVIR 0-0-N-N WVIR 0-0-N-N WVIR 0-0-N-N | CONNECTICUT WVIZ 0-B-C-C WVIR 0-0-N-N WVIR 0-0-N-N WVIR 0-0-N-N |
| COLORADO KFAB 0-0-N-N KLZ 0-0-0 | KANSAS WREN 0-0-N-N WIBW 0-3-0 KFH 0-3-0 | MISSOURI KMBC 2-3-0 WOAF 0-B-C-C KMOX 2-3-4 KSD 0-B-C-C KWK 0-0-N-N | KENTUCKY WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | VIRGINIA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | N. CAROLINA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | S. CAROLINA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | FLORIDA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | ALABAMA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C |
| UTAH KSL 0-B-0 | NEVADA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | ARIZONA KRLD 2-0-4 WBAP 0-B-N-N KPRC 0-B-N-N WDAI 0-B-0 | LOUISIANA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | MISSISSIPPI WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | ALABAMA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | FLORIDA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | S. CAROLINA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C | N. CAROLINA WVIZ 2-3-0 WTAM 0-8-0 WHK 2-3-0 WAGC 2-3-0 WKBW 0-3-0 WVIR 0-0-N-N WSAI 0-0-C-C |

SATURDAY, MAY 2 - 9 - 16 - 23 - 30

8 Eastern Daylight 7 East. Standard Cent. Daylight 6 Cent. Standard Mt. Daylight

Chain programs by 15-minute periods

NBC (Red)

B—Radiotron Varieties: Vocal soloists and orchestra.
C—The Silver Flute.

NBC (Blue)

M—Pianist.

N—Fuller Man: Vocalists; orchestra.

CBS

1—Pryor's Crema Band: Martial band music.
2—Lowell Thomas.
3—Ben Alley: With Ann Leaf at the organ.
4—Wallace Silversmiths.
5—Mary Charles: With Freddie Rich's orchestra.
o—Local Programs.

State and wavelength guides on page 33*

Detail from a 1931 radio publication shows NBC Red, NBC Blue and CBS Saturday broadcasts for the month of May.

four major stations: WGN (Chicago), WOR (Newark NJ), WLW (Cincinnati), and WXYZ (Detroit) linked themselves to broadcast as "The Mutual Broadcasting System." Instead of being controlled and programmed by a central ownership, the stations operated as equals, sharing programs and management. Eventually this network grew to include more affiliates than any of the others — including 950 stations by 1979.

Plagued by poor management practices that included stock manipulation and other shady issues, Mutual began losing affiliates in the mid 1950s and suffered a gradual decline. It has not offered programming since 1999.

The Creation of ABC

NBC and CBS continued to grow and prosper throughout the Depression years. At the start of World War II, the NBC networks were operating 225 stations, or over 25% of the stations in the country.

CBS had overcome its shaky beginnings and had grown to 118 stations, or over 14% of U.S. radio stations. Mutual then had 160 stations, or 20% of the total.

The last of our major national broadcasters came into being when NBC was forced to sell one of its networks. This was the result of a hard-fought 1941 FCC anti-monopoly ruling upheld by the supreme court in 1943. That same year NBC's less-important Blue Network was sold for \$8 million to station WMCA (New York), owned by "Life Savers" candy manufacturer Edward J. Noble. This network became "The American Broadcasting Company" in 1945.

Soon after the divestiture, as more buying and selling of stations took place, the radio affiliate scorecard read: NBC 142, CBS 116, ABC 143, Mutual 219. By 1947, just before the major impact of television and, to a lesser extent, FM, network radio operations were at their peak. Of the more than 1000 AM radio stations broadcasting at the time, 97 percent were affiliated with one or more networks. By 1950, as a result of postwar business expansion, the number of AM sta-

tions had doubled. But only 56 percent of them were affiliated with a network.

Of course the golden age of radio network broadcasting has long passed, but the NBC, CBS and ABC television networks owe much to the planning and creative thinking that began with the "radio craze" of the 1920s.

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W.C. Fields carries on during a 1938 "Hit Parade" program. CBS press release photo.



*The Western Historic Radio Museum is housed in this 1876 Italianate-Victorian building, originally the Parish House for the staff of the adjacent St. Mary's in the Mountains Catholic Church, Virginia City, NV.
Photo by author.*

A Museum for YOU

By Leon Fletcher

Perched on a steep side-street three short blocks off the main drag of the remote historic village of Virginia City, Nevada, is a surprisingly impressive award-winning museum of radio gear. The displays are certainly worth seeing by readers of this magazine.

It's the Western Historic Radio Museum, and although there are more than 10,000 museums in the United States, this one is unique – for several reasons.

First, it's unique because the museum is in the former rectory of the adjacent Saint Mary's in the Mountains Catholic Church. The museum is also unique because, despite its religious heritage, within but a few blocks of it there used to be more than one hundred saloons, more than a score of gambling dens, and about a dozen houses of ill-repute. Today, relics of some of those can still be visited – The Bucket of Blood Saloon, Nevada Gambling Museum, and the Julia Bulette Red Light Museum, to mention but a few.

Still, Virginia City is an appropriate place for the wealth of radios in this museum. For years, the city was called "The Richest Place on Earth." The wealth that came out of the rich mines produced such millionaires as George Hearst, father of the newspaper tycoon William Randolph; John Mackay, who became worth more than 70 million dollars; William Ralston, William Sharon, and Darius

Ogden Mills, who did very well indeed by opening in Virginia City a branch office of the Bank of California; and there were others.

The city has also enjoyed the literary wealth of the newspaper *Territorial Enterprise*, then called "The greatest voice in Nevada" – one of its writers was Samuel L. Clemens, later known as Mark Twain.

But especially unique at this museum are the personalized narratives offered visitors by its owner/operator/curator Henry Rogers (WA7YBS). Henry's a tall, husky, personable guy who is a skilled story teller and has an impressive memory for electronic specifics and historic stories.



A variety of figures set atop many early radios, including this "Rearing Horse & Cowboy." Other designs displayed a moose, hula dancer, and piano.

Photo provided by Henry & Sharon Rogers, owners/operators/curators of Western Historic Radio Museum, Virginia City, NV.

The museum's displays are well-labeled, but he still likes to tell visitors individually about special, significant, and strange points related to the gear they pause to look at. Just moments after each tourist enters the museum, after he's had but a few exchanges of greetings and questions with a visitor, he usually has figured out the interests of the guest. He told me, "Many visitors who come here are devoted radio listeners. Many are hams and other technical types. Collectors of radio and radio gear come here. Some visitors are buyers and sellers of old radio stuff. But most who come here are folks who just like museums – especially unusual museums, like this one."

But Henry is certainly not one of those museum guides who keeps spouting information at

visitors beyond what they want to hear. He's a keen reader of tourists' interests and level of knowledge. For example, he knows I'm a ham, so during my most recent visit he started telling me a lot of technical details about the artifacts which I stopped to look at. But he soon realized that I'm not a tech type – that much of what he was saying was over my head. So he shifted his spiel, started telling me more about the historic background of the gear.

The early radios and the accessories – horn speakers, vacuum tubes, microphones, keys, and such – are arranged chronologically. Displays are changed sporadically. Curator Henry has been collecting the gear for more than 40 years. His collection, he says, is "representative of the evolution of electronic technology and of industrial art design used in radios for the home."

The highlight of the museum is the extensive display of vintage radios. There are hundreds – "Frankly, I'm not quite sure myself how many there are," Henry said.



The vintage ham shack – the 1912 Dodd wireless station. Photo by author.



The museum extends through several rooms of well-labeled exhibits. Photo provided by Henry & Sharon Rogers, owners/operators/curators of Western Historic Radio Museum, Virginia City, NV.

In this museum you'll see the radios your grandparents – and perhaps your great-grandparents – listened to during the early part of the last century. In those days, popular programs included "Sam N' Henry Skits" (1930), forerunner of "Amos and Andy;" "Adventures of Ali Oop" (1933); "Major Bowles Amateur Hour" (1939); and "Jack

Armstrong, the All-American Boy" (1940).

Also intriguing are the autographed posters of famous radio stars. The one of Bob Hope is from the early 1940s, when he was in competition with Jack Benny for the top spot on listeners' surveys. Another signed poster is of Hal "Gildersleeve" Perry; in 1941, he had his own program – "The Great Gildersleeve," a spin-off from the popular "Fibber McGee and Molly Show." And there's a poster of Abbott & Costello – their radio show started as a summer replacement for the "Kate Smith Show."

Amongst the most interesting old radios on display:

- **The Radiola Super-VII**, manufactured by RCA-GE in 1924. It featured a rotatable loop antenna inside the radio's cabinet. This radio also has a "fall board" that, when lowered, automatically turns the set on and provides "the listener with a writing desk for logging stations." Originally it sold

for \$425 – about the same as a new car of those days.

- **The Echophone Radio of 1931**, a 6-tube receiver with an 8-inch Jensen speaker. It had a thumb-wheel for tuning – originally quite popular, but listeners soon lost interest in it because the mechanism wore out quickly and the tuning was not accurate.
- **The 1936 RCA-Victor 10K** featured a cathode-ray indicator that gave the listener visual help in tuning in stations.
- **The General Electric Model G-106 of 1938** – it had 96 (!) preset switches, turned itself on and off at whatever 15 minute segments the listener selected.
- **"The most elaborate ham/swl receiver every built"** – the 1938 *Hallicrafter Skyriders Diversity, Model DD-1* receiver; it had a 26-tube, "dual-diversity receiver."
- **"The ultimate home radio available in 1940"** – the *Scott Radio Laboratory*

WHEN YOU GO

The Museum:

It's a casual operation, but the curator is indeed reliable on his commitments. It's open April thru October, as he says, "most days" – "usually" 11am - 5pm, 1 - 5 :30pm on Friday and Saturday. The curator suggest that you "email curator@radioblvd.com in advance for confirmation that we will be open on the day you plan to visit."

During November thru March, it is "open either by chance or by appointment." Again, email in advance.

Admission: \$2.50 for adults, \$1.00 for children under 12. More information: <http://www.radioblvd.com>.

How to Get to the Museum:

Virginia City is 21 miles south of Reno, via highway 341. From Carson City, take highway 50 East, 7 miles, then turn north (left) at highway 341 for 10 miles.

About midway along Virginia City's main street – named "C Street" – which is but perhaps eight blocks long – is Taylor Street. (Look carefully: street signs are hard to find and some are missing.) On Taylor Street, go down the steep hill three short blocks. The museum is on the right. Look for the red brick and white spires of St. Mary's Historic Church, which can be seen from just about anywhere in town; the museum is adjacent.

Dining:

You'll probably be in Virginia City for lunch; there are perhaps a dozen rather

good dining rooms. I prefer the *Sawdust Corner Restaurant*, 2 South C Street (about the center of the main thoroughway) because of its variety of sandwiches, cleanliness, and ambience.

Lodging:

Accommodations in Virginia City are few and quite modest. Carson City (less than an hour's drive) has two 3-star motels; Reno (also about an hour away) has fifteen 3-star facilities. I prefer to stay in Reno, at the *Silver Legacy*. It's a luxury level, large-scale hotel with fine rooms, and six truly good restaurants offering a variety of dining. There's usually live music in one or more of the hotel's lounges. The main showroom often presents superstar entertainment, such as George Carlin, Jewel, Jay Leno, Engelbert Humperdinck. By reserving a room online, the cost is often much lower than published rates.

Other Attractions:

Virginia City has more than a score of interesting places to visit, including several good museums about the old west, underground mine tours, an operating short-run railroad on which you can ride, old-time mansions, the town's original opera house, and more.

For more information, contact the Chamber of Commerce, 86 C Street, POB 464, Virginia City, NV 89440; phone (775) 847-0311, or go to its online site – <http://www.virginiacity-nv.com>.

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One of the most expensive radios offered in 1929 – priced at \$1,350, about the same as two new Ford Model A sedans. Photo provided by Henry & Sharon Rogers.

ries AM-FM Philharmonic. It had 33 tubes, 60 watts audio power, three speakers – giving “absolutely incredible performance at a thunderous volume,” Henry said. One especially unusual feature of this radio: it included a “Scott Recordomatic” – a unit to cut records.

Some of the early radios had pet names, such as:

- “Cathedral” – a radio in a cabinet with a curved top.
- “Tombstone” – a radio cabinet that’s square-topped.
- “Bullet-shaped” – a table-top radio in a cabinet that’s basically rectangular, but rounded on either the left or the right side to accommodate the circular shape of the speaker, and straight on the other side. The result – yes, it does look a bit like a bullet.
- “Pee-Wee” – obviously a small radio. Generally they were about six inches tall, six inches deep, and perhaps ten inches long. (The owners of those pee wees would certainly be amazed at the size of today’s truly tiny radios.)

Some radios featured special visual designs – some had a statue of a horse or other animal on top; some were built into the shape of a champagne bottle, a slot machine, and such.

Controls and indicators were also varied: push button, push-pull, dual speed tuning, cathode-ray tuning indicator – called “The Magic Eye,” according to RCA advertising.

Also displayed is a General Electric model G-106, introduced in 1938; it has 96 preset switches – “Certainly designed to impress the radio enthusiast’s friends,” according to the museum’s curator.



Reportedly “the hit of the New York Radio Show” in 1939, this “Detrola Pee-Wee Model 197” was available in several colors and combinations of colors. But due to the heat of the radios’ tubes, the cabinets often became cracked or warped.

Photo provided by Henry & Sharon Rogers.

The Philco’s 1939 Model 39-116 featured, according to the manufacturer, the “amazing” “Mystery Control” – a wireless remote control. Besides tuning, the remote controlled the volume, which was motor driven.

Early Spark Gap Station

Probably the most distinctive, valuable, and intriguing display at the museum is “The 1912 Wireless Station,”

pictured on page 20. Henry said, “This is one of the best documented, most complete and accurately exhibited early wireless station in any museum.”

It was originally built by Marion Henry “Hank” Dodd, a creative man with varied interests – real estate, photography, auto repair, and of course radio. He “homebrewed” (made himself) all of the units in his radio station. He had to do that: there were, in the early 1900s, almost no companies that manufactured any equipment that could handle the high power of Dodd’s station – “Probably in excess of one thousand watts,” according to Henry.

Dodd operated the station often, but without a callsign: the government had not yet begun to issue them. Today, the station, because of the danger in activating such old equipment, is not operated.

Technically oriented readers would be interested in the distinctive spark transformer of Dodd’s station. It’s an oak box, lined on the inside with galvanized metal. The box was filled with oil, to insulate the unit. The transformer was submerged in that oil and mounted in paraffin and rosin. A switch on the front of the box was used to adjust the transformer’s output to range from about 10kV to 26kV.

Another technically intriguing unit in the station is a board on which are mounted five detectors to pick up incoming signals. The detectors: Electrolytic, Perikon, Peroxide of Lead, Iron Pyrite, and a stand with “various minerals.”



This 1940 Motorola “Circle Grille” model 50-XC-3 is made of Catalin, a cast resin. Originally the color was creamy white with tan swirls, but over the years exposure to light darkened it to this butterscotch color. Photo provided by Henry & Sharon Rogers.

Today’s recreation of Dodd’s station is a mix of original units and some rebuilt and replicated parts. Indeed, curator Henry went so far as to use much of the original wire Dodd used to connect the units.

The parts of the Dodd station were found in three large steamer trunks in Reno in 1999. Henry was able to reassemble the station with great accuracy because he had photos of the station, plus Dodd’s own books about wireless.

In 2001, The California Historical Radio Society (CHRS) awarded the museum

the Charles D. (Doc) Herrold Award for “outstanding achievement in the preservation and documentation of early radio.” (The CHRS is an organization dedicated to promoting the restoration and preservation of early radio and broadcasting. Doc was “a father of broadcasting,” established a “College of Wireless and Engineering” in San Jose, CA in 1909, and was one of the first to transmit voice by radio.)

Since the museum opened in 1994, attendance has increased gradually, but steadily. Perhaps Mexican poet Octavio Paz (b. 1914) might have foreseen this museum when he wrote, “Museums are our temples.”

Late-breaking News:

Switzerland in Sound “airs” August 1st

A new but familiar “voice of Switzerland”

When Swiss Radio International’s English-language shortwave broadcasts went silent last April, it looked like the end of “the voice of Switzerland.” But starting August 1 – Switzerland’s national day – a new website called “Switzerland in Sound” goes “on the air.” We say this with some irony, because it is an Internet-based service, but in a classic radiophonic style. It’s also the brainchild of a seasoned international broadcaster and radio ham.

The force behind “Switzerland in Sound” is Bob Zanotti, who, after 32 years with the old SRI, once again has a microphone in hand, and is determined to continue the tradition of colorful and interesting reportage about Switzerland and things Swiss – produced with his characteristic touch and enthusiasm.

Switzerland in Sound offers a wide variety of material, ranging from candid one-on-one interviews with interesting people, to exciting trips to destinations all over the country, as well as topical features and items of current interest.

There are also two special attractions on *Switzerland in Sound*. One is the complete anthology of “Letter From Switzerland” that Bob Zanotti authored each month for nine years. The other is the revival, of sorts, of the old communications show “The Two Bobs.” For 24 years, Bob Thomann and Bob Zanotti – the Two Bobs – answered listeners’ technical questions about radio, in a style that was unique. Now they’re back on *Switzerland in Sound*, reminiscing and philosophizing in an hour-long special. In a separate item, they even answer some generic technical questions in their inimitable style.

Switzerland in Sound is a self-financed project, but it is hoped that the costs can be underwritten by outside sources in the future. Check it out August 1st at <http://www.switzerlandinsound.com>

21st Century Radio Communications – Part 1

By Dr. John F. Catalano

The dawning of the new century has ushered us into a revolutionary era of radio communications. The first ten years of the 21st century will change radio communications more than it has changed since the invention of radio over 100 years ago.

We all have many questions and concerns about the radio communications in the 21st century. What type of radio signals will be invading the 21st century airwaves? How high is high frequency in the 21st century? How will the radio receivers of the 21st century look? What is a Digital Radio, Configurable Radio, DSP Radio, Software Definable Radio? Cognitive Radio? How are they different? Will we ever see one on the market? How and why did all this technology get developed? What's the driving force behind all of these changes? ... Important questions, especially to anyone who began their interest in radio communications in the last century ... in other words, all of us!

Over the next few issues we will try to give some insight into the answers to these questions and more. Clues to the future can be found by looking at major developments in radio communications during the past few years. How these developments have been implemented in today's radio products is another indicator of the future technologies. The purpose of this series of articles is to introduce new radio and technology concepts, to stimulate thought as to how our radio world is evolving, and to make some predictions for the next five to twenty years.

We will cover just enough of the theory to give you some idea of the new technological methods. These discussions are not meant to be rigorously complete. Instead they are presented in general concept form as an introduction. Web sites will be included throughout the series for those of you (and I hope it is many) who wish to fully understand the science behind the concepts and perhaps join the development efforts as a career.

We'll start at the beginning of the digital radio revolution, which took place in the last quarter of the 20th century.

From a Spark to an Explosion

The historical beginnings of radio, from early spark gap communications to modern times was the topic of a 2001 *Monitoring Times* series feature articles entitled "The History and Future of Radio." I direct you to this series if you are interested in the how radio developed from its beginning through most of the 20th century. Also included in these articles is a brief overview and comparisons of analog and digital methods.

Software Every-ware

I'm sure most of you have heard the term "software radio," or something similar. Today the dream of radio designers for the past twenty years is becoming a reality. The Holy Grail of radio design is SDR, Software Defined Radio. SDR is as important to 21st century radio communications as superheterodyne once was to the 20th century radio. Simply put, SDR moves radio design from dedicated analog-based circuit hardware to software configurable digital data processing. The SDR will revolutionize radio communication. Clearly the words "software" and "digital" go hand-in-hand in SDR.

A quick review of the basic analog and digital worlds might be a good place to start our journey toward the SDR radio.

Analog and Digital Concepts

This is going to be a very quick and dirty overview of a complex subject. In the analog world, signals are modulated, or converted, in a manner *analogous* to the input signal. For example, let's look at recording of sound, which is a varying air pressure wave. In order to record it on an analog tape recorder, the sound is converted into a varying magnetic field and applied to the iron particles on the tape. To play back the analog recording, magnetic variations are converted into electrical variations. Detection of these small signal variations, which can be very small and difficult to detect, is the limiting factor of analog communications.

The digital world is quite different. Here, by using a circuit called an analog to digital converter (ADC), a sound wave is converted in a series of rapid "on" or "off" pulses. In the digital world these pulses are read as binary based numbers of "ones" and "zeros" respectively. The resulting on/off magnetic field is applied to the tape.

True, this digital conversion process is much more complex than in the analog world. Also the digital process of encoding must be fast enough so that little or no delay is noticeable.

To play back the digital recording, the process is reversed and the magnetic digital signal of "ons" and "offs" are converted into the original high fidelity analog sounds with crystal clarity.

Only two variations, on and off, need be detected, instead of an almost infinite number of variations of an analog signal. Further, the signal amplitude between the two levels is relatively large. Clearly (pun intended) digital methods provide cleaner, clearer signals. Just look at the quality of a VHS tape and compare it to its big brother, DVD!

You can imagine that the digital processing speeds and computer power to accomplish these processes require some complex high-speed hardware. But the results can't be beat!

That's enough of background. What we covered we'll need later. Now let's get on with 21st century radio technology story.

Enter the Digital (Audio) Radio

What is a Digital Radio? Well, this term is evolving almost as fast as radio technology itself! In the last quarter of the 20th century the military communications market demanded digital radio systems for maximum receive-ability under adverse conditions and to provide a measure of security. Back then, the "digital" referred to a digitizing of the audio. This was accomplished via traditional analog circuitry with some new circuit twists called Analog to Digital (ADC) and Digital to Analog Converters (DAC), see Figure 1-1. These simple circuits, together with the semiconductor electronics technology of the day, were fast enough to cope with the audio frequency spectrum of 100 to 20,000 Hz.

In 1992, Collins Radio introduced into the consumer/professional markets the revolutionary model 926 communications receiver, which was PC controlled and utilized DSP in the audio section. See Figure 1-2. The performance of the DSP audio filtering really wowed the communications world with adjacent signal heterodynes becoming things of the past. The 926 was derived from a Collins receiver supplied to the military market, but the DSP audio concept was soon to become a feature on many ham and SWL receivers.

Perhaps it was about this time that radio designers began to dream of moving the digitalization from just the audio section to more of the radio circuits. But with limitations in speed and complexity of semiconductor technology of the early 1990s, it was just a dream.

Cell Phones Hit The Airwaves

The staggeringly huge cellphone market was exactly what the semiconductor companies needed to get out of the slump they found themselves in, in the closing years of the 20th century. The thought of everyone carrying around an analog two-way

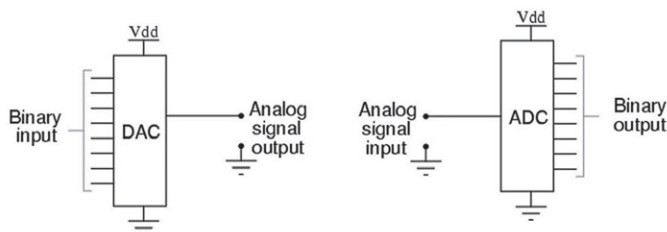


Figure 1-1 – Simple Analog to Digital (ADC) and Digital to Analog Converter (DAC) Circuits

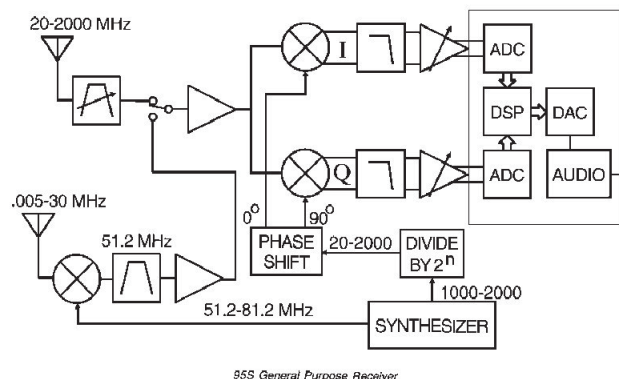


Figure 1-2 – DSP Audio Radio Collins 926 circa 1993

high frequency radio made the semiconductor industry's financial mouths water. Integrated circuit companies turned their massive and powerful attentions to the design of micro-miniature, silicon circuit, 800MHz radio blocks.

Once just the realm of high cost, low volume, military and professional markets, these companies used all their technical and manufacturing muscle to create low cost, commodity, circuit blocks to enable the introduction of a consumer priced 800 MHz portable transceiver – i.e., cellphone.

The NEED for Digital Grows!

Today, electronic technological advances are usually motivated by market need. The larger the market potential the more aggressively the electronics industry works to fulfilling the seemingly impossible market requirement. This was the case with digital audio as Philips Electronics was leading the charge to make their digitally encoded optical Compact Disk invention the replacement of the LP record. Digital encoding, and of course decoding, of audio was springing up in communication and entertainment markets and becoming the norm as the 20th century was ending.

At the same time, satellite TV was planning to grow from its hobby status to a full-fledged high volume consumer product. But the industry was demanding something better and more efficient than the analog signals that it had endured from birth. That meant a move to digitally encoded signals.

Cellphones Go Digital

As the demand for cellphones grew, the 800 MHz band was becoming very crowded, possibly limiting the cellphone companies' business. This fact, plus some issues of privacy from monitoring, gave the initial motivation to move to digitally modulated cellphones.

As the digital market has matured, a number of different digital encoding cellphone standards have been adopted by different countries and phone companies. This has become increasingly costly to cellphone companies who sell into many different encoding markets. Today they find it difficult and costly to balance their inventories of different types of cellphones using different digital standards.

One Radio – Many Uses

The thinking goes like this. Every radio receiver has the same basic block functions. However, manufacturers have to make changes to some circuits depending upon their frequency, digital encoding/decoding method, application, etc.

The military's "one radio" requirement came about as a result of a number of deadly incidents. Since each one of the USA's armed services are tasked with different mission objectives, their communications needs are also different.

However, in joint operations, this leads to Army troops not being able to easily communicate with, say, Air Force aircraft. This inability to communicate has been the cause of an alarming, and growing, number of friendly fire casualties.

The military first experienced these communications problems in 1983 in Grenada and then in 1991 during the first Persian Gulf War. But the military's need would escalate with world events of the 21st century, and they knew it.

The Configurable Radio

Although their motivation was profit, cellphone manufacturers also had the need for a radio that could change itself to fit the situation, just like the US military.

Now, assuming all the required hardware building blocks for all different requirements were built-in to a radio. Then the signal path could be directed to the required circuit blocks and around other blocks by a programmable series of simple logic switches or gates. In this way, the radio's hardware circuits could be configured to the desired functions. This concept probably came from a radio designer who remembered his youth spent with Heathkit, Lafayette and Radio Shack electronic experimenter's labs.

Simple Beginnings

These "labs" consisted of a piece of wood or cardboard upon which a number of components, transistors, light bulbs, resistors etc, were mounted. On each connection of each component was a spring. The lab, with a fixed set of hardware components, could be rewired by connecting wires to the springs in different configurations to make many different electronic devices. Does that bring back childhood memories?

Imagine that instead of boards with large components we have a piece of silicon, or a number of pieces, with a much larger number of total micro-components. Instead of manually connecting, the connections are routed via logic gates, or switches, which can be programmed to be open (no connection) or closed (connected). You have just constructed a programmable array.

Let's take this one step further by making the micro-components into groups of components wired into circuits used in communications receivers, such as AM, FM, and digital

audio decoders, stages of IF, RF and audio filters and amplifiers. Now, using user one-time controlled switches or gates we can "configure" the radio to whatever our need requires. And with that, we have a configurable function radio. Of course, all the added unused circuitry makes this hardware-intensive, programmable switched array approach very expensive, limiting its use to military and professional markets.

Wishful Thinking?

With the advent of commonly available digitized audio integrated circuits, radio designers began again to dream. The dream of making all signal manipulation from the antenna to the speaker into digital data and therefore controllable by mathematical algorithms was near. This would be the truly digital radio.

Let's go back to ones and zeros and see exactly what this means to users.

Digital's Real Edge!

As we saw earlier with digital audio radios, once we digitize a signal it is reduced to a mathematical representation of the signal in the form of ones and zeros. These binary words can be manipulated using mathematical formula, or, as software engineers like to call them, algorithms and transforms.

Let's look at an over-simplified example. During most of the 20th century, in order to demodulate a FM signal we would have to build an FM demodulator using hardware components such as diodes, resistors, and inductors.

Instead, in the digital world we can calculate what effect these components have on the signal using circuit theory. For example, a resistor-capacitor-inductor (RLC) combination would transform the signal using a time constant determined by their relative values. A transistor acting as a gain stage would impart a characteristic amplification to the signal. These very simple examples can be applied to complex multi-circuit functions.

In the digital world we can cause the same effects as the hardware by subjecting the digitized signal to the same set of signal conditioning mathematical transforms. The effect of the hardware LRC circuit can be defined mathematically by the same set of equations we used above, dependent on their component values. To demodulate a digitized FM signal all we need is a faster microprocessor that can take the formula equivalent of the RLC and run our input signal through it.

Flexible Hardware

The hardware required in the digital case is a complex, fast running processor and its equally fast "A to D" and "D to A" converters. In fact, in component count the digital circuit would take more than one hundred thousand more components to decode FM than its analog equivalent! However, in the 21st century, integrated circuit technology is routinely capable of producing circuits having a million devices on a small piece of silicon. So circuit complexity is not necessarily a limiting issue. But still, where is the savings?

The savings is that hardware – the digital

signal-processing integrated circuit – need only be designed once and then can be mass-produced. These production stages are the most expensive and time-consuming steps required to bring a new integrated circuit-based product to market.

If we were designing a traditional analog circuit-based integrated circuit radio, a new design and manufacturing run would be needed *each* time we wanted to change a function, very costly in time and money.

With our digital signal-processing chip (within some limitations) the same integrated circuit can produce many different manipulations on the incoming signal just by programming the processor with different software algorithms. Meet the Software Definable Radio concept.

“Within Limitations”

Let’s not forget that the frequencies which we can digitize, and the complexity of the programmed functions, are limited by the speed of our digital electronics, among other factors. The higher the speed of our input signals and the more complex signal manipulations we desire, the faster the required digital electronics must be.

If the direct conversion radio, which digitizes the signal right from the antenna, were possible, we could say goodbye to messy analog! Then all control, functions, and operating modes would be configuration via software. But in order to realize this dream, complex, inexpensive chips having low power consumption and very high speed processors (at least 1 GHz) would be needed. A very tall technical order during most of the 20th century. In fact, to some it seemed to border on science fiction.

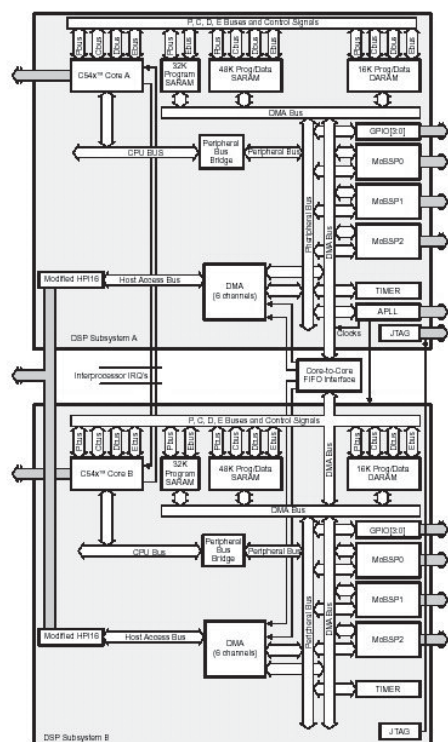


Figure 1-3 – Block Diagram of TI DSP Chip TMS320vc5420

**DSP : Block Diagram
Digital Radio (Generic)**

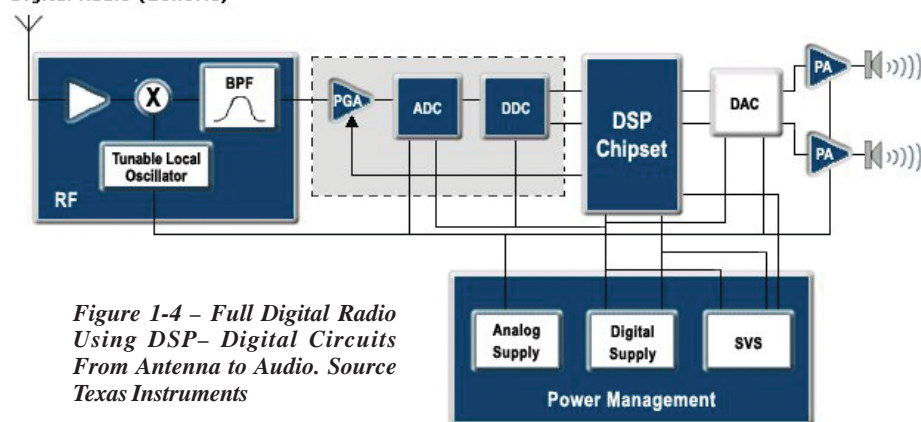


Figure 1-4 – Full Digital Radio Using DSP- Digital Circuits From Antenna to Audio. Source Texas Instruments

A Piece of the Puzzle

We can now begin to answer the first question we posed: What’s the driving force behind these radical changes in radio communication? In part, it is the rapid development of high-speed digital integrated circuits and microprocessors for the huge and competitive personal computer market.

Wake Up, Silicon Guys!

Silicon manufacturers began to see the need to design and manufacture off-the-shelf, complex integrated circuits aimed squarely at communications applications. By combining fast processors, digital encoding/decoding control and digitally configurable filtering all on a single chip, the Digital Signal Processor, DSP, was born in the factories of Texas Instruments (TI) in the late 20th century. See Figure 1-3 for a block diagram of a TI DSP chip, vintage 1999.

DSP technology was a step in the direction toward the SDR, but the technology of the day lacked the microprocessor muscle required to handle the number of complex computations required to function as a complete receiver. And, of course, there was the processor’s speed, which further limited the functions as well as the frequency of the input signal. DSP began to appear in communications products, replacing some functions of the receiver, usually in the audio section.

By the mid 1990s, DSP had proven the concept of a digital processor being able to configure and control signal processing methods, albeit in limited manner. Today, DSPs are so common that just about every PC sound card is built around one.

As faster digital electronics were developed, the digitized portion took a larger part of the radio receiver. The goal to convert the RF signal to digital form right from the antenna was moving from dream to reality. See Figure 1-4, the all digital radio.

Electron Speed Limits

In the 21st century, with 2.8 GHz personal computers being sold at under \$800, gigahertz-processing speeds are common and relatively inexpensive. Where has all this processing speed come from?

To find the speed-limiting factor of circuits we have to take a little detour into semiconduc-

tor device physics. In order to make this a detour and not an odyssey, we’ll take some literary liberties and keep it simple.

Electronics is all about moving electrons. The basic circuit element of a modern-day integrated circuit is the MOS (metal-oxide-semiconductor) field effect transistor. This device consists of two “electrodes,” the source and drain, separated by a third. The electric field on the “separating electrode,” called the gate, controls the flow of electrons from the drain to the source.

One factor that controls the transfer speed of the electrons is the gate width. The smaller the gate width, the faster the field can propagate and the shorter the distance the electrons have to traverse. The speed to gate width relationship is not linear but logarithmic. This means that speeds increase by a large amount with a small decrease in width.

Advances being made by the semiconductor companies are constantly reducing the minimum size structure that can be reliably manufactured in high volume. This minimum structure has been reduced from 5 microns (1 micron = 0.000000000001 meters) in 1985 to 0.1 microns in 2004.

Simultaneously, the size of the silicon area that can be reliably manufactured and the number of on-chip components have also been increasing at a rapid rate. In the 1980s the component count was in the hundred thousands. Today it is approaching tens of millions. This means that more devices can be placed on a single “chip,” allowing for whole “Systems on Chip” (SoC) to be designed and manufactured.

Pieces In Place - Almost

As we have seen, required technological “pieces” to make a full digital software definable radio a reality are in place. Planning for the third generation of SDRs are in progress. Will it be an all software radio using a PC-type platform? What is a “cognitive” radio?

Remember, in order for a technology to transition from prototype development to production, it requires industrial “Godfathers” in a number of industries who are willing to risk their own career on the product’s success. Next time we’ll answer these questions and more. We’ll also see if the industrial climate is right for SDR to become a real, high volume, commodity, 21st century product.

New Tricks for Old Dishes

Hundreds of thousands of black mesh satellite TV dishes ranging from 6 to 10 feet in diameter are choking the landfills of America. Abandoned by their owners in favor of the more discreet small dish satellite TV systems, these old C-band dishes are still useful to satellite monitors and experimenters, and they can usually be had for free by asking the owners who just want to have them removed from their property. As long as the dishes are in good physical shape they can be rehabbed to a variety of broadcast satellite monitoring uses.

You can install a used C/Ku-band dish at your home and use it to feed a regular analog satellite receiver to pick up in-the-clear channels or with a used VCII decoder to watch standard cable fare (for a fee). If you have a 4DTV receiver you can watch digital cable programming as well as news/business/sports and entertainment channels, also for a fee, though some 4DTV programming is also unencrypted. There are also dozens of commercial-free, announcer-free music channels in this format.

◆ What to Look for in a Used Dish

Almost any black mesh dish made in the last 10 years will work well if you check out this short list of what to look for: Complete dishes which include feed horn supports (single, triple or quad support), a dish mount (which has welded-on brackets to support a dish mover or actuator arm), and a real plus would be the attached LNB (Low noise Block Downconverter) which amplifies the received signal. If you're removing a dish from the previous owner's yard you'll be able to take everything but the in-ground cable. Most dishes, when taken out of service by dealers had their feed horn, LNB, and actuator arm removed.

Avoid fiberglass dishes (too heavy, too old) and mesh too big for Ku-band signals. Avoid rusted dishes with missing panels and pass up dishes with bent rims and dented panels. If space is no object choose 10-ft dishes over 6-ft dishes because of the extra gain achieved with the bigger dish.

◆ Set Up MPEGII Stand-alone Dish

One of the most interesting things to hap-

pen to the big dish satellite industry was the advent of digital broadcasting. Immediately heralded by consumers as the last nail in an already nail-filled coffin lid, digital transmissions were indeed unwelcome. It has instead turned out to be a boon for home dish viewers.

Packing as many as 10 compressed, digital signals into the space of one analog transponder, the number of viewable channels has sky-rocketed. Consumers who bought Free-To-Air (FTA) MPEGII digital satellite receivers capable of tuning in these unencrypted channels, have enjoyed watching dozens of new services including network TV, cable services and many small network channels available nowhere else (see "What's on Where").

Those channels and many more are still there today. They tend to be clustered on satellites convenient to their targeted audience. For example, most of the foreign, ethnic programming is found on the Ku-band side of Telstar 5. Here dozens of channels of programming from Asia, India and the Middle East (most FTA), including many radio stations in native languages, are found.

Setting up a stand-alone Ku-band dish to pick up any or all these channels is easily and cheaply done. In fact, several companies offer such systems (see "Resources") in a variety of configurations. Because these dishes don't have to move and they use LNBs (like the small dish systems), which allow reception of both polarities, only one RG/6 lead-in cable is used in the installation.

Unlike the small dish systems, however, satellites such as T-5 are relatively low power and require a 70 or 90 cm diameter dish. The other reason DirecTV or DISH Network dishes won't work for these satellites is because DSS signals are circularly polarized and broadcast satellites are linearly polarized (i.e. horizontal/vertically polarization). And, don't bother using DirecTV or DISH receivers for these FTA channels because they use proprietary encryption systems to receive only their own services.

Most FTA MPEGII receivers automatically search and save channels available on the various satellites, so it's just a matter of turning the dish to the correct satellite and have the receiver hunt and store the channels for you. You can later edit the channels to exclude ones you don't have an interest in.

If you are using an MPEGII FTA receiver in conjunction with an analog C-band receiver, simply loop the LNB cable through the FTA receiver and then to your analog receiver. Take the channel 3 output of both and use an A-B switch to select between the two outputs for viewing on your TV set or your VCR. This way you can record programs from either source.

There are many other configurations to add content from your FTA receiver to your system depending on the type of TV and/or VCR you may have. New digital ready TV sets have as many as seven video inputs which really expands your viewing options. Read your manuals to find out how.

◆ Add DSS to Your Existing Dish

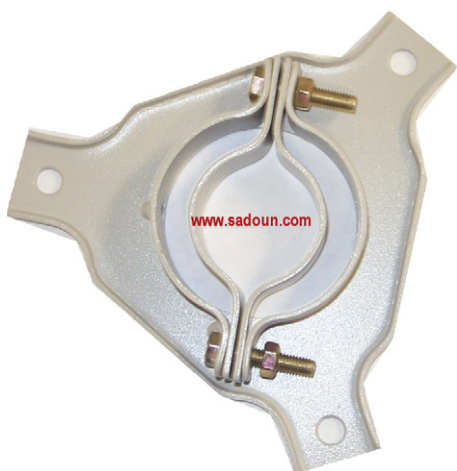
Many big dish viewers have added the small dish systems to their video line-up, but still like to keep their C-band channel options for easy viewing. One way to do this is by adding a C-band/DSS LNB feed to your existing big dish system. This clever device is a regular C-band scaler ring with a small dish LNBF attached. This allows you to use your big dish to get DirecTV or DISH Network programming in addition to your C-band viewing.

Most big dish installations have two runs of RG6 coax cable running from the receiver to the dish. The extra run of cable is intended for a Ku-band LNB, but most installations are C-band only. This leaves the extra cable run to be attached to the DSS LNBF. Use your dish to rotate to the DSS satellite when you want to watch small dish programming. Rotate the dish to your favorite C-band satellite when you want to watch the in-the-clear C-band programming or the channels not available on either small dish system such as sports and news feeds, syndicated programming feeds, or MPEGII audio and video services.

Two things you have to pay attention to with this type of feed: 1) the DSS feed is offset, i.e. not looking at the center of the dish, so you have to do some fine tuning to get the strongest signal, and 2) some C-band dishes, particularly the 6 and 8 foot sizes, may not be that efficient at reflecting signals in the DSS range (12 GHz).

◆ Convert a C-band Dish to DSS-only

If you are making the switch from C-band to DirecTV or DISH Network you can use your old C-band dish as a small dish antenna and avoid doing a new installation. Simply remove your C-band feed horn and LNB from the supports and, using a DSS adapter plate available from Sandoun Satellite TV (see photo), install the required DSS LNB in its place. You can use the controller from your C-band system to move the dish from one DSS service to the other.



Bolt-on collar adapts a Ku-band LNB to your existing dish. Uses tripod support. (Courtesy: Sadoun Satellite Sales)

You can also use this set-up to explore the availability of FTA DSS services. There are many audio services on the Canadian DSS satellite Nimiq 1 (91° W) which can be heard using an MPEGII FTA receiver and a DSS LNB.

◆ Convert an Old PrimeStar Dish to MPEGII FTA

When the old PrimeStar DBS service was bought by DirecTV years ago all the old PrimeStar dishes and receivers were tossed. The PrimeStar dishes were designed to pick up PrimeStar programming which was transmitted on standard Ku-band frequencies and so they are great candidates to be used in a stand-alone MPEGII FTA system. Thousands of these dishes are still knocking around in junk shops, flea markets, the backs of dealers stores and sometimes just lying on the ground where the installers left them.

The dishes were exceptionally well made



Can't find an old PrimeStar dish in your neighborhood for free? Buy a new old stock PrimeStar dish and Ku-band LNB in original box from Global Communications. (Courtesy: Global Communications)

and the LNBs were superb. They can be used to give outstanding service in receiving any standard Ku-band broadcasts. You can watch news and sports feeds and the previously mentioned MPEGII FTA broadcasts, which include an amazing number of video and audio services. If you can't find one lying around in your neighborhood you can get a new in-the-box PrimeStar dish while supplies last from Global Communications (see "Resources").

◆ How to Find those Digital Satellites

Finding satellites with an analog receiver used to be easy. Now that there are so many satellites with no analog transmissions, it's impossible to find them without some sort of tuning aid. The best way is to use a spectrum analyzer – a sophisticated electronic tool which displays all manner of information about a satellite but carries a hefty price tag. Here are two easy ways to find these satellites which are much cheaper.

The first is a simple tuning meter (see photo). This device is inserted in-line on the RG/6 coax from the dish. It shows relative signal strength from the output of the LNB. If you know the general vicinity of the satellite you're looking for, you can see the meter jump up as you cross the path of the satellite's signal. Simply adjust the east/west movement and elevation of the dish to peak for the strongest reading. Shop around for the best price.

A more sophisticated version is the Spectralook, an electronic signal strength meter which uses your TV set to display not only the signal strength of the satellite but shows the number of active transponders as well (see photo).



Peak your existing satellite system for greatest signal strength at the dish with an in-line signal strength meter such as this one from Tru-Spec. (Courtesy: Skyvision)



Finding satellites with digital signals is made easier with SpectraLook, an inexpensive way to display satellite signal strength and on-board activity. (Courtesy: Smalleer Technologies)

◆ Last Word

FCC rules concerning satellite TV reception allow you to have a dish up to 3-feet in diameter no matter what your Homeowner's Association or local ordinances say. That's a dish big enough to pick up dozens of interesting Ku-band channels. Keep in mind that new MPEGII channels are being added almost daily so check in to <http://www.lyngsat.com> regularly. Now, expand your viewing options and you will be amazed at what you'll see!

What's On Where

Satellite MPEGII Programming on Ku-band (for details go to <http://www.lyngsat.com>)

AMC 3 (87° W) Many PBS feeds including E and W coast feeds and HDTV feed

Telstar 5 (97° W) Numerous India, Asian and Mid-East Channels

AMC4 (101° W) Chuck Harder's People's Network (new home of YUSA Old-Time-Radio)

G10R (123° W) Many local TV stations from around the U.S.

Resources

For more information on complete satellite systems, MPEGII receivers and accessories for tuning in to broadcast satellites check out the following sources.

Global Communications <http://www.global-cm.net> 608-546-2523. Sells MPEGII receivers, LNBs and many other related items including new old stock PrimeStar dishes.

Sadoun Satellite Sales <http://www.sadoun.com> 888-589-9595. Complete dish systems and MPEGII receivers. Sells LNB prime focus mounting collar for Ku-band LNB sizes 62-40 mm. \$20 plus \$5 s/h.

Skyvision <http://www.skyvision.com> 800-500-9275 Mail order satellite TV gear with everything from complete C-band systems to small dish systems. Many hard to find items.

Smalleer Technologies <http://www.dvbexpress.com> Sells MPEGII receivers and an assortment of small dish systems.

<http://www.lyngsat.com> Easy to use broadcast satellite web page lists what's on every transponder of every satellite. Has viewing parameters for MPEGII channels.

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- ◆ SWL IR Remote for ICOM Transceiver . . . \$69.95
- ◆ SWL IR Remote for ICOM IC-R75 \$79.95
- ◆ SWL IR Remote for JRC NRD-535 \$89.95
- ◆ SWL IR Remote for Lowe HF-150, HF-225 \$79.95
- ◆ SWL IR Remote for Kenwood R-5000 \$79.95
- ◆ SWL IR Remote for Uniden Scanners \$89.95

www.swl-remotes.com

Q. *I attempted without much success to find a CB handy-talkie; is CB dead? (Tyron Walker)*

A. Not dead, but not healthy. CB is still heard in diminishing numbers among hobbyists and on the open road. But with alternatives like no-code amateur radio, the Internet, cellular telephones, and low-cost, portable communications devices like GMRS, FRS, VHF-marine, MURS, and even toy 49 MHz radios readily available, the low-antenna-efficiency, low-frequency, CB walkie-talkies are pretty much history.

Q. *How is it that I can hear AM and FM radio stations when I'm driving through certain tunnels, even though the earth should be shielding them from reception? (Mike, Bantam, CT)*

A. It's called "leaky coax." Some cable manufacturers offer coaxial transmission line designed to let some of the signal out through its shielding, as witnessed in the Lincoln and Holland tunnels, for example.

Q. *I would like to either buy a T2FD complete, or get a kit and build one. Anything available, especially that pesky 6:1 balun? (Tony Webster, 8P6NE, Barbados)*

A. It's been years since I've seen a tilted, terminated folded dipole (T2FD) commercially offered, or even put into ham use by building at home. Even the comprehensive *ARRL Antenna Book* and *Handbook for Radio Amateurs* ignores the design. I think that dipole clusters, Windoms, transmatches, and multiband verticals have made that design, with its built-in resistive loss, less appealing.

A good background discussion of this antenna including recommendations on how to use a conventional 4:1 balun transformer may be found at <http://www.hard-core-dx.com/nordicdx-antenna/wire/t2fd.html>. Also check the November 2002 "Antenna Talk" column in *Monitoring Times*.

A more technical treatise with answers to every question you might have may be found at <http://www.cebik.com/t2fd.html>.

Q. *I have not flown in years. Since the laws and procedures regard-*

ing electronics aboard commercial aircraft have recently changed, are scanners allowed on aircraft? I have been told that having an FCC license can help. And how about a scanner in Las Vegas Casinos? (David Whitten, Waco, TX)

A. After a recent round trip to Hawaii, I can personally attest to the fact that *no* electronics are allowed to operate during runway taxi, takeoff or descent, and while flying at cruising altitudes, only computers and non-RF emitting devices (DVD, MP3, etc.) can be turned on. No radios are allowed.

Anticipating this ban, I made a crystal detector for the aircraft band, coupled to a high-gain amplifier so I could listen to pilot conversations. Since it was entirely an audio device and not a radio, it didn't violate any regulations.

So far as a scanner in a casino, I think that you would be a sitting duck for the security troops who are scrutinizing the crowds for any suspicious activity that might resemble intercommunications among players! When in Las Vegas, I scan while outside of the casino gambling areas. It is interesting traffic.

Q. *Is it possible that the weakening of the earth's magnetic field over geologic time, including pole reversals, could be affected by man's artificial magnetism? (John Morris, email)*

A. Scientists believe that the earth's magnetic field is generated by circulating electrical current within its iron-nickel core, a "dynamo" effect. While the field is weak, even the total magnetic energy of all artificially-generated electromagnetic fields created by technology pale in comparison. Man-made magnetic fields are confined, erratic and isolated when compared to the giant magnetic earth. And virtually all of the artificial magnetism is alternating from 60 Hz on up, from power lines through microwaves, and the higher the frequency, the less it can penetrate the earth crust or alter the effects of Earth's DC magnetism.

Q. *Is the choice of lead-in for shortwave reception important? Do I need 50 ohm coax rather than 75 ohm? (Various inquiries)*

A. No. At these lower frequencies, many alter-

natives are available with minimal signal loss. First of all, no common shortwave receiving antenna maintains constant impedance over its operational range (2-30 MHz), so choice of impedance in a transmission line is of no consequence. Secondly, losses from poor insulation material is of little consequence at low frequencies.

Years ago, it was common – even for transmitting – for hams to use house wire, TV twin lead and even lamp cord ("zip" cord) for transmission lines at shortwave frequencies. Global communication was easily accomplished at low power. Nowadays, better coax at low cost is readily available.

Even if there were some moderate signal loss, shortwave signals are mixed with atmospheric noise, so even if both noise and signal are reduced somewhat, the receiver's automatic gain control (AGC) circuitry compensates for that. You would hear no difference, even if the S-meter shows reduced signal strength.

Since our homes and offices now generate far more electrical interference than they did years ago, it's a good idea to use shielded transmission line (coaxial cable) out to the antenna, but don't worry about its impedance.

Q. *If I were to put two scanner beams on a mast with one about 4 to 5 feet above the other and point them in the same direction, then connect them to the same radio with a splitter (used in reverse as a combiner), would it double the gain in that direction? (Tim Rapps, Springfield, IL)*

A. Yes, if all is perfect and there are no losses, but doubling the signal strength is only a 3 dB increase, barely perceptible to the ear when compared to background noise. The improvement is more in narrow-beam-width directivity than gain, thus reducing co-channel interference.

Questions or tips sent to Ask Bob, c/o MT are printed in this column as space permits. If you desire a prompt, personal reply, mail your questions along with a self-addressed stamped envelope (no telephone calls, please) in care of MT, or e-mail to bobgrove@monitoringtimes.com. (Please include your name and address.) The current Ask Bob is now online at our website: <http://www.monitoringtimes.com>

56

As I type this, the rain and cool weather in Spokane has significantly delayed the start of a predicted, bad summer wildfire season. If you are still hunting for the wildland fire frequencies in your area, be certain to monitor all the government VHF possibilities between 4:00-5:00 pm. There is usually a very detailed daily fire weather bulletin that goes on for several minutes.

This is also a good time to hit the Scan or Search button to check for UHF links, repeater inputs, outputs, and PL tones. The Pro 92 is my weapon of choice for this duty. The ability to find the PL tone is a great feature of this solid radio. Computer programming allows me to load up several banks of likely frequencies, in numerical order, of course. There is also an early morning bulletin, but who gets up early?

The 5:00-7:00 pm time slot is good for listening to the 154.XXX standard fire frequencies. Volunteer fire departments use this time slot to do a daily pager test and make any announcements about evening meetings, training sessions, etc.

57

I have been monitoring some of the new 7.5 kHz narrow band technology frequencies. I used the 5, 6.25 and 12.5 kHz steps to get as close as possible to the new frequencies on the VHF bands.

These new frequencies are the result of a congressionally mandated "re-farming" by the FCC. I was a little shocked to find that the voices seem a bit muffled. Does any one have suggestions?

I hope the radio manufacturers are gearing up for the correct technology in their next generation of scanners and transceivers. I was really disappointed to see the new Icom R-20 does not have this capability. As a teaser, I will give you a couple of new narrow band frequencies in use by the Idaho Department of Lands. Try 159.1125, and 151.2125. Consult the *Police Call* book or CD ROM for the new narrow band frequencies in your area.

58

On one of my interstate travels, I stopped at a truck stop. I always find something new that is useful in the radio hobby.

This time it was a clipboard that hangs over the steering wheel. It can also be used as a lap board. The bottom has a very nice "L" shelf that holds a handheld radio or two, or even three. If they tend to slide off, Velcro tape will keep them in their place. A reasonable accessory for \$10. **See photo**

59

With a recent press conference, the feds implied they had "good, credible intel" that an Al Qaeda attack was near. I decided to get my scanners ready. I remembered that *MT* has reported all those unique military FRS-style frequencies in the 399 MHz range, nationwide mutual aid, Urban Search and Rescue, and FEMA. Sometimes I forget what a wonderful resource we have here in *MT*. Keep those back issues, or go high tech with past years' anthologies. As Tom Ridge would say, "We can be afraid, or we can be ready." He is talking about our scanners, right?

60

I have signed up for the automatic email equipment news from various radio dealers. A recent one from R&L Electronics foretold of a special on the Alinco 596 dualband amateur transceiver. For \$159, new in the box, I could not pass this one up. I also get the automatic updates of used equipment listings at most of the major dealers.

61

Are you programming or viewing your scanner in little or no light? Hiking in low or no light – perhaps out on a public service, or emergency callout? Personal headlamps have long been used by the search and rescue folks, hikers, campers, etc. So what is new? Can we spell LED?

I did some simple research on the internet, and found that many manufacturers are still using halogen and regular bulbs. I also found many new technology models that use LEDs. These use just two AA batteries, or three AAA batteries, that store in the same compartment as the actual headlamp. It is unbelievable how long two AA batteries can power an LED. There are some new "super one watt" LEDs that are quite bright, about three times the light of regular LEDs.

If you are like most radio monitors, you tend to be concerned with disaster preparedness. This product is a MUST have. I am going to save you some money, and time. I purchased about a dozen of these lamps. First observation: If it uses a Xenon, halogen, or "standard" bulb, forget it! Even if it is a "hybrid" with LEDs, forget it.

The tip-off is the time duration with alkaline batter-

ies. Old headlamps get about 6-15 hours. Plus they often require replacement bulbs at \$3-6 a piece. The bulbs are very fragile compared to the nearly indestructible LEDs, which are good for an average of 10,000 hours. Yep, let me repeat that, ten thousand hours. The LEDs also get many more hours of use from the same batteries. Using one to three LEDs will give you 30-150 hours of light on a pair of AA, or three AAA batteries.

I actually sampled several lamps by going outside on a moonless night, and walking around my heavily forested 20 acres. Once my eyes adjusted, I could see quite well on even one LED. Of course I had aimed the lamp at the path immediately in front of my feet. I was not trying to light up objects at a distance.

And the winner is ... well, any of those that cost less than \$30, and have three or more LEDs, or a "super bright LED." My personal favorite is the Inova 24/7. It does cost a bit more, but has several possible settings. It can be used as a self defense light (bright flashing strobes), or any of nine separate settings, using white, red or orange LEDs. It can be carried in the palm of your hand, around the neck with an optional lanyard, or an adjustable head band, or clipped to another object. Second choice is a headlamp from Streamlight. If you are first responder, I cannot imagine a "Grab and Go Bag" without this item.

62

Traveling on a vacation, or business trip? Protect your collection of rubber ducks, and telescoping antennas, using a lightweight PVC pipe with end caps.

Next month is a really great column. I highlight all the bright ideas I used in setting up my new Ford Escape SUV with radio in mind.



Reshuffling the Frequency Deck

In crowded urban areas it can often be a challenge for public safety agencies to find enough available frequencies to handle all of their communication needs. As we've discussed in earlier columns, public safety channels in the greater New York metropolitan area are extremely crowded. Every available channel is assigned to someone, and yet there is a demand for more frequencies.

The Federal Communications Commission (FCC) is seeking comment on a request from seven public safety agencies in New York and New Jersey to use unassigned paging channels. Although the filing deadline for comments will probably have passed by the time you read this, the issue of assigning other spectrum to public safety users is an ongoing issue that will be increasingly common in the future.

In this particular proposal there are seven agencies involved, five in New Jersey and two in New York:

- City of Bayonne, New Jersey
- County of Bergen, New Jersey
- Borough of Fort Lee, New Jersey
- Jersey City, New Jersey Police Department
- Melville, New York Fire District
- County of Somerset, New Jersey
- Syosset, New York Fire District

These organizations all got together and worked out a joint proposal, which they then submitted to the FCC. The proposal involves shuffling current assignments among the agencies and adding some new frequencies from unassigned paging channels. The intended uses for the new frequencies are spelled out in Part 22 of the FCC's regulations. To give you an idea of the complexity of the request and the way these frequencies are entangled, here are the details:

Bayonne, New Jersey

Bayonne wants the exclusive use of frequency pairs 470.0375/473.0375, 470.1750/473.1750, 470.2875/473.2875, 476.1250/479.1250, 476.1750/479.1750, and 476.2500/479.2500 MHz. They are also asking for 473.0875 MHz for mobile communications.

Frequency 470.0375 MHz is currently licensed to Fort Lee.

Frequency pair 470.2875/473.2875 MHz previously was licensed to Somerset under call sign WPPB311 but has been deleted.

Frequency 473.1750 MHz is licensed to Jersey City under call sign WPXI593.

Frequencies 473.0375, 473.0875, 470.1750, 476.1250/479.1250, 476.1750/479.1750, and 476.2500/479.2500 MHz are unassigned Part 22 frequencies.

Bergen County, New Jersey

Bergen County has asked for frequency pair 470.2375/473.2375 MHz.

Frequency 470.2375 MHz is currently subject to an application filed by Bayonne.

Frequency 473.2375 MHz is an unassigned Part 22 frequency. Under the proposal, the FCC would assign the pair to both Bergen County and Melville, since both agencies agree to the sharing and they are far enough apart geographically to avoid interfering with each other.

Fort Lee, New Jersey

The proposal requests that Fort Lee be given exclusive use of frequency pairs 470.0500/473.0500, 470.1875/473.1875, 470.2750/473.2750, 476.0500/479.0500, 476.1000/479.1000, and 476.2625/479.2625 MHz, along with 473.0125 and 479.1375 MHz to be used for mobile communications.

Frequencies 470.0500, 470.2750/473.2750 MHz are currently licensed to Jersey City under call sign WPXI593.

Frequency 479.1375 MHz is currently licensed to Syosset under call sign WPYJ816 but would also be licensed to Fort Lee, since both agencies agree to share it and they're far enough apart to avoid any interference with each other.

Frequencies 473.1875 and 476.2625/479.2625 MHz are currently licensed to Fort Lee under call sign WPWS499.

Frequencies 473.0500, 479.0500, and 476.1000/479.1000 MHz are unassigned Part 22 frequencies.

Unassigned Part 22 frequencies 470.1875, 473.0125 and 476.0500 MHz are subject to applications filed by Bayonne.

Jersey City, New Jersey

Under the proposal, Jersey City would have exclusive use of frequency pairs 470.0625/473.0625, 470.1125/473.1125, 470.2625/473.2625, 476.0250/479.0250, 476.0875/479.0875, 476.1500/479.1500, 476.2250/479.2250, and 476.2750/479.2750 MHz, with frequency 473.2125 MHz for mobile use.

Frequencies 470.1125 and 470.2625/473.2625 MHz are currently licensed to Fort Lee under call sign WPWS499.

Frequency 470.0625 MHz is subject to an application filed by Bayonne.

Frequency 473.0625 MHz is currently unassigned in the New York area.

Jersey City is currently authorized to use frequencies 476.0875, 476.2750/479.2750, and 479.2250 MHz under call sign WPXI593.

Unassigned Part 22 frequencies 473.2125 and 476.0250/479.0250 MHz are currently subject to an application by Jersey City.

Part 22 frequency 476.2250 MHz is currently unassigned.

Unassigned Part 22 frequencies 473.1125 and 476.1500/479.1500 MHz are currently subject to applications filed by Bayonne.

Unassigned Part 22 frequency 479.0875 MHz is subject to an application filed by Somerset.

Melville, New York

Melville would receive use of frequency pairs 470.1625/473.1625 and 470.2375/473.2375 MHz under the proposal.

Melville has a pending application for Part 22 frequency pairs 470.1625/473.1625 and 470.2375/473.2375 MHz.

Frequency 473.1625 MHz is currently licensed to Fort Lee under call sign WPWS499.

Frequency 470.2375 MHz is currently subject to an application filed by Bayonne. As explained above, this is part of a frequency pair that will be licensed to both Melville and Bergen.

Unassigned Part 22 frequency 470.1625 MHz is subject to an application filed by Melville.

Somerset County, New Jersey

The proposal includes Somerset being authorized the exclusive use of frequency pairs 476.0125/479.0125 and 476.0625/479.0625 MHz and frequencies 470.1375 (pager), 473.0250 (mobile), 473.2000 (mobile), 479.1125 (mobile), 479.2000 (mobile), 479.2375 (mobile), and 479.2875 (mobile) MHz.

Frequencies 470.1375, 476.0125/479.0125, 476.0625/479.0625, 479.2375, and 479.2875 MHz are licensed to Somerset under call sign WPPB311.

Frequency 473.2000 MHz is currently licensed to Jersey City under call sign WPXI593.

Frequency 473.0250 MHz is currently subject to an application filed by Somerset.

Unassigned Part 22 frequency 479.1125 MHz is subject to an application filed by Somerset, FCC File No.0001196273

Unassigned Part 22 frequency 479.2000 MHz is subject to an application filed by Bayonne.

Syosset, New York

Syosset is currently authorized exclusive use of frequency pairs 476.0375/479.1625, 476.1375/479.1375, 476.1875/479.1875, 476.2375/479.2375, and 476.2875/479.2875 MHz under call sign WPYJ816.

Under the proposal, Syosset would be licensed on frequency 479.0375 MHz and would delete frequency 479.1625 MHz.

Now, to summarize, if the proposal is approved this is how the frequencies will be used:

PROPOSAL:

| | |
|-------------|---|
| Bergen | 470.2375/473.2375 (shared with Melville) |
| Fort Lee | 470.0500/473.0500 470.1875/473.1875 470.2750/473.2750, 476.0500/479.0500 476.1000/479.1000 476.2625/479.2625 473.0125 (mobile) 479.1375 (mobile) |
| Jersey City | 470.0625/473.0625 470.1125/473.1125 470.2625/473.2625 476.0250/479.0250 476.0875/479.0875 476.1500/479.1500 476.2250/479.2250 476.2750/479.2750 473.2125 (mobile) |
| Melville | 470.1625/473.1625 470.2375/473.2375 (shared with Bergen) |
| Somerset | 476.0125/479.0125 476.0625/479.0625 470.1375 (pager) 473.0250 (mobile) 473.2000 (mobile), 479.1125 (mobile) 479.2000 (mobile) 479.2375 (mobile) 479.2875 (mobile) |
| Syosset | 476.0375/479.0375 476.1375/479.1375 476.1875/479.1875 476.2375/479.2375 476.2875/479.2875 |

In order to legally grant the request, the FCC must determine five things:

- (1) no other spectrum allocated for public safety use is immediately available;
- (2) there will be no harmful interference to other spectrum users who are entitled to protection;
- (3) public safety use of the frequencies is consistent with other public safety allocations in the local geographic area;
- (4) the unassigned frequencies were allocated for their present use not less than two years prior to the grant of the application at issue; and
- (5) the grant of the application is consistent with the public interest.

To meet these requirements, the proposal asserts:

- (1) a search for available spectrum indicates that the UHF channels sought are the only viable alternative;
- (2) the applications and waiver requests are supported by independent engineering analyses which show that little or no interference would be experienced by license holders using nearby frequencies;
- (3) each public safety agency states that its request is consistent with other public safety entities licensed on 470-480 MHz, Part 22 paging control channels in New York and New

Jersey; the engineering analysis also demonstrates that the 470-512 MHz band is already heavily used in the New York City area for public safety operations;

- (4) the unassigned frequencies at issue were allocated for Part 22 on August 2, 1994, which became effective on January 1, 1995; therefore the unassigned frequencies were allocated for their present use more than two years ago; and
- (5) granting the applications and waivers requests will be in the public interest as it will allow otherwise vacant spectrum to be used by the public safety agencies for critical communications.

The bottom line for the FCC seems to be that these kinds of waivers improve public safety without hurting existing license holders. If they can satisfy these requests without anyone complaining, it's a safe bet that they'll be approved.

For scanner listeners, it means that you'll find public safety activity on frequencies you might not otherwise expect, especially in busy urban areas.

Arkansas

Hello Dan

I have recently moved to Northwest Arkansas and I am amazed at the growth that is taking place here, specifically in Washington and Benton counties. Would it be possible for you to do a story on this area with frequencies for this area? Thanks for your time and I look forward to reading your reports in the future.

— Jonathan in Springdale, Arkansas

Benton and Washington Counties are in the far northwest corner of Arkansas, bordering Oklahoma and Missouri. Each county has approximately 160,000 residents spread out across roughly 900 or so square miles.

I have a few systems for you to get started with, but be sure to make use of the search feature of your scanner! Frequency listings are useful, but the best way to find new activity is to spend time hunting and listening.

Benton County

Bentonville, the county seat for Benton County, operates a Motorola Type III hybrid system for the police, fire and other city services. Frequencies used are 856.2625, 857.2625, 858.2625, 859.2625 and 860.2625 MHz. Use the following fleet map:

| | |
|--------|--------|
| B0: S2 | B4: S0 |
| B1: S0 | B5: S4 |
| B2: S0 | B6: S4 |
| B3: S0 | B7: S4 |

You should be able to hear the Police Department Dispatch on talkgroup 1F and Fire Dispatch on 4A. There are other talkgroups out there, but I don't have a complete list of them. Also, isn't part of the fun of scanning a new area finding out what talkgroups are active?

The County Sheriff has several frequencies listed and they're split up by geographic area:

| | |
|----------|----------|
| 451.5500 | South |
| 452.2750 | Central |
| 460.2750 | East |
| 460.3250 | Citywide |
| 460.4500 | West |

The City of Rogers is licensed for 155.205 MHz, among others. You may also be able to find county road crews on 154.980 and 155.100 MHz.

Washington County

Sheriff:

| | |
|---------|-----------------|
| 452.800 | West |
| 452.875 | Small Towns |
| 452.900 | North |
| 453.375 | Jail and Events |
| 453.475 | South |
| 453.575 | East |
| 458.375 | Talk-Around |

Washington County Fire is listed as 154.3550, 453.0750, 453.7500 and 460.6250 MHz, with Emergency Medical Services on 460.6250 and sharing 453.0750 MHz.

The State of Arkansas operates a statewide Motorola Type II analog system, which has a tower near Rogers (Benton County) transmitting on 856.7625, 857.7625, 858.7625, 859.7625 and 860.7625 MHz. There are three more towers in Washington County that might interest you. The first is near Berryville, operating on 856.9375, 857.9375, 858.9375, 859.9375 and 860.9375 MHz. A site near West Fork uses 856.3125, 857.3125, 858.3125, 859.3125 and 860.3125 MHz. A tower north of Combs is using 856.4625, 857.4625, 858.4625, 859.4625 and 860.4625. See a pattern here?

I hope that's enough to get you started, Jonathan, and please write in again to let us know what you find!

Illinois

I am in the state of Illinois, which is changing to the Motorola Starcom21 system. Do you know if the Radio Shack Pro96 will work with this system?

In particular I have heard the Starcom21 system will use 700 MHz frequencies, which the Pro96 does not have.

Any information would be appreciated.

— Augie in Illinois

Starcom21 ("Statewide Radio Communications Network for the 21st Century") is a statewide digital radio system owned and operated by Motorola, which is headquartered in the Chicago suburb of Schaumburg. Coverage testing of the new network is scheduled to be complete by September and the State Police should be ready to use it on September 28, 2004. A seven-year contract between Motorola and the State of Illinois promises 95% geographic coverage as well as in-building coverage in many urban areas. Each of the nearly 200 repeater sites will be monitored from Schaumburg 24 hours a day, 7 days a week. The total project cost is somewhere in the neighborhood of \$70 million.

Starcom21 is compliant with APCO Project 25 standards and will run with 9600-baud control channels. That compliance should be relatively easy to enforce, since Motorola will not allow Project 25 radios from other manufacturers to operate on the system.

Starcom21 users pay Motorola a monthly fee while Motorola has full responsibility for maintaining and operating the system. The published fee is \$53 per month per radio, although

agencies that donate their own licensed frequencies to the system will receive some type of discount.

Besides the Illinois State Police and the Illinois Tollway Authority, for whom the system was originally designed, Motorola is promoting the ability to communicate with other Motorola customers. For example, Chicago and Northwestern University police departments, cities and towns from Hoffman Estates and Schaumburg down to Springfield and Champaign, and a dozen state prison facilities are all using Motorola radio systems, presumably making interoperability easier.

As you might expect, a statewide system uses a lot of frequencies. The following are currently allocated to Starcom21: 854.9625, 855.2125, 855.7125, 856.2125, 856.2375, 856.4375, 856.7125, 856.9375, 856.9625, 856.9875, 857.2125, 857.2625, 857.4375, 857.7125, 857.9375, 857.9875, 858.2125, 858.2625, 858.4375, 858.7125, 858.7375, 858.9875, 859.2125, 859.2625, 859.4375, 859.7125, 859.7375, 859.9875, 860.2125, 860.2625, 860.4375, 860.7125, 860.7375, 860.9875, 861.2125, 862.2125, 866.4125, 866.8875, 867.0750, 867.3875, 867.4125, 867.9125, 868.4375, 868.8875, 868.9875 and 868.9625 MHz.

Because Starcom21 is an APCO Project 25 system, the PRO-96 will track it just fine. The Uniden BC296D and BC796D scanners will also handle the 9600-baud control channel; however, the older BC250D and BC785D models will not.

I've also seen the press releases about using 700 MHz channels, but it's nothing to worry about for a couple of years yet. By way of background, 24 MHz worth of spectrum – 764 to 776 MHz paired with 794 to 806 MHz – was reallocated from UHF broadcast television to public safety use. Unfortunately for public safety agencies, they can't use any 700 MHz frequencies until TV broadcasters vacate the band. The current deadline for them to clear out is December 31, 2006, but that date may be delayed depending upon how well digital television is accepted by consumers. So, the way it looks right now, you won't have to worry about needing a 700 MHz scanner for at least two years.

McHenry County, Illinois

Even traditionally small suburban counties are moving toward digital systems. McHenry County, a 600-square-mile county about 50 miles northwest of Chicago, is floating a \$6 million proposal to purchase a trunked radio system. The network would replace the low band VHF radio systems used by the small communities throughout the county and allow public safety agencies to easily and directly communicate with each other during emergencies. The county hopes to pay for the new system with money from federal and state grant programs and has started to work with their congressional representatives to identify sources of funding, including the Department of Homeland Security.

Although interoperability is the main reason



given for the new system, growth is the driving factor. McHenry County is the fastest growing county in Northeastern Illinois and has a higher growth rate than any other county in the state. Since 1980 the population has grown more than 75 percent, from nearly 150,000 two decades ago to more than 275,000 today.

Most of the existing radio systems in the county operate in the 150 MHz band.

| | |
|------------------------|----------------------|
| Police | |
| McHenry County Sheriff | 155.790 and 159.210 |
| County Jail | 155.52 |
| Algonquin | 154.740 |
| Cary | 857.2375 |
| Crystal Lake | 155.700 and 156.030 |
| Harvard | 154.875 |
| Hebron | 154.770 |
| Huntley | 158.850 |
| Lake In The Hills | 154.430 and 155.1075 |
| Marengo | 154.875 |
| McHenry | 159.090 |
| Spring Grove | 155.790 |
| Union | 154.875 |
| Woodstock | 154.845 and 154.875 |

Mutual Aid Box Alarm System

More than 500 fire departments in Illinois are part of the Mutual Aid Box Alarm System (MABAS), which began in 1968 as a way to provide day-to-day assistance between nearby fire departments in the Chicago metropolitan area. Since then MABAS has grown to more than 40 operating divisions stretching from Indiana to Ohio, up into Wisconsin and down to St. Louis.

MABAS is activated nearly 700 times each year in non-disaster incidents such as extra alarm fires, multiple victim automobile accidents, and hazardous materials incidents. MABAS can also provide specialized rescue and support services, such as dive teams, heavy rescue squads, ladder trucks and water tankers.

When a local fire department realizes they need additional assistance they contact a MABAS division dispatcher. The dispatcher will then use the Interagency Fire Emergency Network (IFERN) frequency of 154.265 MHz to make an announcement that includes the type of alarm and a requested Box Alarm – a kind of pre-defined assistance plan. Fireground frequencies are also supposed to be standardized, so if you hear a color reference use this table:

| | |
|---------|-------|
| 150.790 | Green |
| 153.830 | Red |
| 154.280 | White |
| 154.295 | Blue |

MABAS Division 5 covers McHenry County.

| | |
|----------------------|---------------------|
| Fire | |
| County Fire Dispatch | 154.250 and 154.355 |
| Fireground | 153.830 and 154.385 |
| Algonquin | 154.355 |
| Crystal Lake | 156.165 |
| Huntley | 154.25 and 154.265 |
| McHenry Township | 154.385 |
| Woodstock | 154.010 and 154.130 |

Daytona Beach, Florida

Police and fire calls for Daytona Beach, Florida, will soon be dispatched by the Volusia County Sheriff's Office, over the objections of the city communications officers. The city hopes to save \$2 million



over a 5 year period by paying the county rather than maintaining their own dispatch system. The Sheriff's Office is already dispatching calls for several other cities including DeBary, Deltona, Lake Helen, Oak Hill, Orange City, Pierson and South Daytona. It also dispatches Beach Patrol and provides law enforcement services for smaller towns without local police departments.

Volusia County, home to nearly half a million residents on Florida's Atlantic coast, operates an EDACS (Enhanced Digital Access Communications System) for more than a dozen cities and agencies. The network is built on three distinct trunked systems to cover different areas of the county. When programming your scanner, remember that EDACS frequencies must be entered in Logical Channel Number (LCN) order.



| System A: | System B: |
|-------------|-------------|
| 01 855.2125 | 01 856.2625 |
| 02 856.7375 | 02 856.9875 |
| 03 857.2625 | 03 857.7625 |
| 04 858.2625 | 04 858.4875 |
| 05 858.7625 | 05 859.7125 |
| 06 859.7375 | 06 860.4875 |
| 07 860.7125 | 07 855.4625 |
| 08 855.7375 | 08 856.4875 |
| 09 856.7625 | 09 857.4875 |
| 10 857.7375 | 10 858.7375 |
| 11 858.7125 | 11 859.2625 |
| 12 859.4875 | 12 859.7625 |
| 13 860.2625 | 13 860.7375 |
| 14 860.7625 | 14 855.7375 |
| | 15 856.9375 |
| | 16 858.2625 |

Daytona Beach:

| |
|-------------|
| 01 856.7125 |
| 02 857.2125 |
| 03 858.2125 |
| 04 859.2125 |
| 05 860.2125 |

| | |
|--------|-----------------------------------|
| 11-041 | Daytona Beach Fire Dispatch |
| 11-042 | Daytona Beach Fire Tactical 2 |
| 11-043 | Daytona Beach Fire Tactical 3 |
| 11-044 | Daytona Beach Fire Tactical 4 |
| 11-045 | Daytona Beach Fire Tactical 5 |
| 11-046 | Daytona Beach Fire Tactical 6 |
| 11-047 | Daytona Beach Fire Tactical 7 |
| 11-053 | Daytona Beach Fire Talkaround |
| 11-061 | Daytona Beach Police 1 - Mainland |
| 11-062 | Daytona Beach Police 2 - Beaches |
| 11-063 | Daytona Beach Police 3 - Tactical |
| 11-065 | Daytona Beach Police 4 - Teletype |
| 11-066 | Daytona Beach Police 5 - Speedway |

That's all for this month. Keep those e-mails coming in to dan@monitoringtimes.com, and as always you can check my website at <http://www.signalharbor.com> for more frequencies and other radio-related information. Until next month, happy scanning!

Frequency Hogs in Hogtown

Scanning Canada recently learned that the "Mike" service (a digital radio/cellular commercial service) operated by Telus Mobility is causing interference with Metro Toronto Police frequencies. The problem shows up when police cruisers are within about 200 meters of one of the many hundreds of Telus Mike antennas around the city.

Metropolitan Toronto police officers use their Mobile Data Terminals (MDTs) to look up license plate numbers in the police computer system. The data transaction usually takes around two seconds to complete. However, the Mike system interference can slow the response down to as much as ten minutes – long enough for a subject vehicle to be several kilometers away before the officer has access to the driver's traffic violation history.

Resolution of the problem will involve a public expenditure of one and a half million dollars to replace the radio systems in Metro cruisers. Telus Mobility is reported to have declined to accept any liability for the problem.

All eyes are now turning towards Canada's frequency regulator, the CRTC (Canadian Radio and Television Commission). Whether the tab is picked up by the federal government or the City of Toronto, the bill will land in the hands of taxpayers. As one western Canadian author has written, "Tax me, I'm Canadian."

❖ Scan Alberta

There is a very keen and active scanning group based in the western province of Alberta. This group regularly gets together for coffee meets and is focused strongly on monitoring emergency services. The group's main discussion forum used to be the Alberta Scanning Enthusiasts Yahoo group, but most of the discussion has now moved over to their own website at <http://www.scanalberta.com>. This website is a controlled site and you will have to register to gain access.

The Alberta scanning enthusiasts are very serious about the scanning hobby and once you have established that you are a bona fide scanning enthusiast, the group will welcome you and give you access to their discussion groups and other content. *Scanning Canada* congratulates the Alberta Scanning Enthusiasts for their dedication and serious approach; keep up the good work, guys.

❖ GeoScanning

Scanning Canada recently learned of a global project to photograph every point on the surface of the Earth where a line of longitude intersects with a line of latitude. (Another way to en-

joy your GPS receiver, not covered in this month's feature story - ed.) *ScanCan* thought it would be interesting to use this as a way of finding points of interest from a scanning perspective.

Here is how it works. Many of us technophiles own a variety of electronic devices in addition to our scanners (and have to explain the reasons for continuing to add to our collections to our significant others). *ScanCan*'s shack contains a growing collection of radios as well as a frequency counter and GPS receiver. One sunny Sunday afternoon in the late spring of this year, *ScanCan* loaded up the mobile shack with a military surplus bag full of techno-devices and headed for one such confluence of global coordinates.



80.00 deg. West,
44.00 deg. North

Our target for the day was a point in southern Ontario at the intersection of 44 degrees north and 80 degrees west. Many of these points on the Earth's surface are found in the middle of an ocean, or in a farmer's field. The intersection of 80degW and 44 degN was found at a much more interesting place. *ScanCan*'s mobile monitoring station headed out along one of the most picturesque areas in the region – the Hockley Valley.

The GPS counted down the kilometers as the target approached. As we reached within a few hundred meters of the target, we slowed down to locate the precise point of intersection of the global coordinates. Finally the target was reached as the mobile monitoring post parked up near a bridge where the road crosses the Nottawasaga River. As you can see from this month's picture, the intersection of 80degW and 44degN lies on a residential deck overlooking the river (look and envy). This month's frequency table lists some of the frequencies that can be monitored in the vicinity of this intersection.

We all live within reasonable driving distance of a similar intersection of the world's major coordinate system. Why not break out your GPS and camera and send a picture to *ScanCan* at the e-mail address at the head of this column (or via snail mail to *MT* for forwarding to *Scanning Canada*). If readers express an interest in this project *Scanning Canada* will feature other GeoScanning monitoring targets.

Emergency Services:

149.44 152.00 419.41

154.07 158.96

Province of Ontario
(GMCO- ambulance
service)
Town of Orangeville

154.37 154.67 158.24

31.42 153.28

Fire Department
Township of Adjala-
Tosorontio Fire De-
partment
Headwaters Health
Care Centre (hospita-
l with air ambu-
lance)

Fast Food Drive-thru:

30.84
464.01

Kentucky Fried Chicken
Tim Hortons

Municipal Services:

151.09

Town of Orangeville
Recreation Centres

154.45 154.56

Town of Orangeville Works
Department

163.86

Town of Mono Roads Dept
Dufferin County Roads
Dept

163.89 165.71

Township of Adjala-
Tosorontio Roads
Department

169.16

Town of Caledon Roads
Department

928.84 952.84

Regional Municipality of
Peel

Miscellaneous:

49.17 72.42
172.98

Hydro One Networks Inc
Hockley Valley Resort (ski
resort)

167.42

Laidlaw Transit Ltd (school
buses)

Paging (listed to identify frequency counter hits, but not for monitoring):

453.19 931.56

Bell Mobility

454.61

Telecator

929.29

Madison Telecommunica-
tions Inc

929.41 929.49

Northstar Paging Ltd

931.74

Mobility Personacom
Canada

Digital (iDEN) services:

862.34

864.49 865.49 Tele-
Mobile Company

Cellular wireless network management:

869.00

Rogers Wireless, Bell
Mobility

Government Mobile Communications Project

Many of *Scanning Canada*'s frequency lists contain a reference to the "GMCO," but what exactly is the GMCO? Next month *Scanning Canada* will explain the function of the Ontario Government's Mobile Communications Office and its 15 year project to revitalize the province's radio systems. Until then, enjoy the rest of your summer.

Unauthorized Utilities in Amateur Bands

Most utility frequency lists stop at amateur band edges. After all, what would be in there? It's all hams, chasing various operating awards, sharpening up their emergency capabilities, or just shooting the breeze about their equipment, right? Wrong. Utilities turn up in there all the time.

Most of these utilities are perfectly legal, operating with the full authorization of their government of license, which is authorized in turn by various national and regional exceptions to international radio allocation treaties. This makes interference from distant stations inevitable to some degree, but it's all part of the game. In fact, here are the only high-frequency (HF) amateur allocations where some kind of utility or broadcast operation is NOT legal somewhere in the world:

7050 to 7100 kilohertz (kHz)

14000 to 14250

21000 to 21450

28000 to 29700

Anyone in the above bands that doesn't have an amateur license is fair game for an intruder write-up by the many radio clubs that send logs to the International Amateur Radio Union (IARU). It's probably the most widely deployed intercept network in the world. Add thousands of avid "DX" (distant transmitter) chasers, constantly listening with well-trained ears and ultra-high-gain antennas, and you have next to no chance of unobtrusive utility operation. But operate they do, apparently without fear.

❖ Unlicensed Pacific Stations

Even in areas where utility operation in amateur bands is permitted, stations still need licenses, and must still follow the usual rules on transmitter power, spectral purity, allowed emission types, and so on. This doesn't always mean much.

HF utility listeners, especially in Australia, South America, and parts of the Western US, have long complained about unlicensed operation of

amateur gear in Indonesia. That whole Pacific region in general has many completely isolated islands where just about anything goes, not to mention a whole maritime class of sailors at sea. Some nights it sounds as if they are all yakking on HF at once, all the way from lowest to highest frequencies being propagated by the ionosphere.

In the amateur bands, this phenomenon seems to grow upward from 7000 kHz, the lower limit of the 40-meter band, using upper or lower sideband (USB or LSB). 7000 can sound like the US "Citizen's Band" at the height of the CB craze, but even stranger. Families and groups gather on air, sing songs, pray, make weird noises, and speak in various local dialects, creating general chaos.

When the cacophony on 7000 gets too intense, operators jump upward in 5-kHz channels, to 7005, 7010, and so on, going as high as 7020 sometimes. A few have graduated to the 20-meter band, where the DX is better in daytime. Here, the low end is already populated by a few other semi-legal or illegal utilities (more on these later). One bunch gathers up and down from 14100 kHz, better known to licensed operators as the world propagation beacon frequency. This is just about the worst place they could have picked, but presumably it sounded quiet. Oops.

❖ Africa

It is often hard enough to find steady electricity, let alone affordable wire, fiber, or satellite bandwidth, on this often troubled continent. HF is the way to go. It's used by the people, and also by hundreds of non-governmental organizations (NGOs). Some NGOs are affiliated with the United Nations, Red Cross, Red Crescent, or various religious groups, while others are just organized by small groups of skilled people to bring in otherwise missing services.

Many NGOs have contracts with commercial HF e-mail networks. But anyone who has done serious field work will tell you that sometimes they just do what they must, including operating without a license. Tanzanian NGOs are on 7005 (again), 7022.5, and 7023 (a different operation), all upper-sideband (USB). In the former Zaire, now called the Democratic Republic of the Congo, and in surrounding countries, unlicensed USB operations are on 7050, 14000, 14235, 14325, and 21021. Similar operations come and go in Rwanda. And in Somalia, where ham radios and communication gear are easily available, unlicensed operation is common on many frequencies.

❖ Government/Military/Spooks

Other utilities pop up in amateur bands year after year, operating in a grey area of the law. One famous example is the "numbers" station usually called "Frank Young Peter" from its distinctive callup using non-military phonetics. Sometimes its robotic voice continues with phonetic 5-letter, code groups.

FYP has a fairly regular schedule on 7000 and 14000 kHz USB. The European Numbers Intelligence Gathering And Monitoring Association (ENIGMA) has given it the designator E15, and the transmitter has been tentatively located near Cairo, Egypt. "Nancy Adam Susan" is another callup used by this station on other frequencies.

A Morse code (Continuous Wave) "numbers" station, one of ENIGMA M23's variants, has been snagged on 14320. It was most recently heard repeating the number "310," which presumably means something to someone somewhere, for 10 minutes.

The Russian and Chinese militaries go everywhere. Forty meters has an illegal cluster of those weird, single-letter, CW beacons. Loudest are "D," Odessa, on 7038.7; "P," Kaliningrad, 7038.8; "S," Arkhangelsk, 7038.9; and "C," Moscow, 7039.0. Less common are "K," Kamchatskiy, 3594 and 7039; "V," Khiva, 3658; and "M," Magadan, 3594 and 7039.3. Weirdest of all is a spurious from "K" on 7000.

"L9CC" is another longtime CW intruder, possibly Chinese. It's heard all over, running channel markers or calling stations like "CP17." Other, possibly Chinese, CW stations are BQQJ, XDJ, and XDZ.

The Russian military is also well-represented by RDL, REA, and RGT, all established stations using CW and radio teletype (RTTY). RDL's keying is defective, and its frequency drifts badly. We also find a whole gaggle of those Russian 4-figure CW call signs heard all over HF. As always, these are highly drilled, formal traffic nets, passing short coded messages in standard form.

There's plenty more, but this will be a good start. The World Wide Web has several amateur sites that keep intruder logs, and these are worth checking occasionally for possibilities. Keep cool until next month.



The picture is of a Barrett 923 mobile HF E-mail terminal using Pactor-II or voice

ABBREVIATIONS USED IN THIS COLUMN

| | |
|----------|--|
| AFB | Air Force Base |
| ALE | Automatic Link Establishment |
| AM | Amplitude Modulation |
| ARB | Air Reserve Base |
| ARQ | Automatic Repeat Request teleprinting system |
| ARQ-E3 | French ARQ teleprinting system |
| CAMSLANT | Communication Area Master Station, Atlantic |
| CAMSPAC | Communication Area Master Station, Pacific |
| Coq-8 | Coquelet-8, French teleprinting system |
| CW | Morse code telegraphy ("Continuous Wave") |
| DEA | US Drug Enforcement Administration |
| DSC | Digital Selective Calling |
| E03 | British intelligence, starts with "Poacher" tune |
| E10 | Israeli intelligence "numbers", standard callup |
| EAM | Emergency Action Message |
| FAX | Radiofacsimile |
| FEC | Forward Error Correction teleprinting system |
| G22 | Eastern European "numbers" in German |
| HF-GCS | High-Frequency Global Communications System |
| HFDL | High-Frequency Data Link |
| LDOC | Long-Distance Operational Control |
| LSB | Lower Sideband |
| M22 | Israeli Navy 4XZ, weather and "numbers" |
| MARS | Military Affiliate Radio System |
| Meteo | Meteorological |
| MFA | Ministry of Foreign Affairs |
| MX | CW single-letter markers/ beacons |
| PR | Puerto Rico |
| RCC | Rescue Coordination Center |
| RSA | Republic of South Africa |
| RTTY | Radio Teletype |
| S28 | Buzzing marker for Russian UZB76 |
| S30 | Time-beep-like marker for Russian voice |
| SHARES | SHARed RESources |
| SITOR-B | Simplex Teleprinting Over Radio, FEC mode |
| UK | United Kingdom |
| Unid | Unidentified |
| US | United States |
| XM | "Backward Music"/"Whale Sound" sweeps |
| XSW | Russian noise, probably a "numbers" marker |
| VOLMET | Flying Weather (loosely from French) |

All transmissions are USB (upper sideband) unless otherwise indicated. All frequencies are in kHz (kilohertz) and all times are UTC (Coordinated Universal Time). "Numbers" stations (encrypted, usually unidentified, broadcasts thought to be intelligence-related) are identified in () with their ENIGMA station designators, as issued by the European Numbers Intelligence Gathering and Monitoring Association.

| | |
|--------|--|
| 518.0 | ZSJ-South African Navy, SITOR-B Navtex at 1635. (Bob Hall-RSA) |
| 2670.0 | NMN37-US Coast Guard Group, Fort Macon, GA, notices to mariners at 0107. (Rick Baker-OH) |
| 2789.5 | FUE-French Navy, Brest, RTTY test loop at 0148. (Ron Perron-MD) |
| 3336.2 | "L"-Albanian CW single-letter channel marker (MX), Tirana, at 2103. (Ary Boender-Netherlands) |
| 3658.0 | "V"-Russian Navy CW single-letter channel marker (MX), Khiva, at 2107. (Boender-Netherlands) |
| 3756.0 | "The Pip"-Russian Army CW channel marker (S30), at 2100. (Boender-Netherlands) |
| 3810.0 | HD210A-Ecuador Navy Oceanographic Institute, Guayaquil, with an AM standard time broadcast in Spanish, at 0246. (Camilo Castillo-Panama) |
| 3828.9 | "The Squeaky Wheel"-Russian Army USB channel marker (XSW), at 2105. (Boender-Netherlands) |
| 3855.0 | DDH3-Hamburg Meteo, Germany, FAX weather chart at 2141. (Boender-Netherlands) |
| 4295.0 | FUE-French Navy, Brest, RTTY test loop at 2310. (Hall-RSA) |
| 4325.8 | "R"-Russian Army CW single-letter channel marker (MX), Izhevsk, at 2120. (Boender-Netherlands) |
| 4333.5 | FUX-French Navy, Le Port, RTTY test loop at 2316. (Hall-RSA) |

| | |
|--------|--|
| 4418.0 | FDU1-Israeli intelligence (E10), female phonetic "numbers" voice, at 2105. (Boender-Netherlands) |
| 4625.0 | "The Buzzer"-Russian Army AM channel marker (S28), at 2102. (Boender-Netherlands) |
| 4721.0 | Reach 3632-US Air Force, calling Andrews HF-GCS, no joy at 0121. (Mark Cleary-SC) |
| 4739.0 | Fiddle-US Navy, Jacksonville, FL, calling Cardfile 71C, no joy at 0017. [Back to the old callsign, apparently. - Hugh] Fighting Tiger 22-US Navy, clear and secure with Golden Hawk, Brunswick, ME, at 0108. (Cleary-SC) |
| 4991.0 | X61-US drug interdiction aircraft, calling PANTHR (US DEA, Bahamas), in ALE, also on 5912, at 0027. (Cleary-SC) |
| 5000.0 | YVTO-Venezuela Naval Observatory, Caracas, AM standard time broadcast in Spanish, at 0250. (Castillo-Panama) |
| 5153.9 | "S"-Russian Navy CW single-letter channel marker (MX), Arkhangelsk, also on 7038.9, 8484.9, and 10871.9, at 2120. (Boender-Netherlands) |
| 5696.0 | Coast Guard 6527-US Coast Guard, radio check with CAMSLANT, VA, at 0030. (Baker-OH) |
| 5717.0 | Trenton Military-Canadian Forces, calling Halifax Military, and vice versa, couldn't hear each other, at 0020. (Cleary-SC) |
| 5732.0 | J13-US drug interdiction aircraft, working OPB (DEA Operations, Bahamas and Tortugas) in ALE, then voice as 13C working Panther (DEA, Bahamas), at 0153. Service Center-US Customs Service, patching 91J to Hammer (March ARB, CA), at 2341. (Cleary-SC) |
| 6340.5 | NMF-US Coast Guard, Boston, relay of CAMSLANT FAX weather chart, at 2148. (Boender-Netherlands) |
| 6379.0 | 4XZ-Israeli Navy, Haifa (M22), CW marker at 0215. (Castillo-Panama) |
| 6491.5 | LOR-Argentine Navy, Puerto Belgrano, RTTY weather in Spanish, also on 8303, at 0004. (Hall-RSA) |
| 6496.5 | CFH-Canadian Forces, Halifax, NS, weather FAX at 0610. (Hall-RSA) |
| 6694.0 | Rescue 311-Canadian Forces rescue aircraft, patch via Halifax Military to Halifax RCC, at 0111. (Cleary-SC) |
| 6697.0 | Awareness-US military, with an "hour plus 7/37" EAM, simulcast on 8992, 11244, and 13155, at 0307. (Jeff Haverlah-TX) |
| 6712.0 | Reach 9002-US Air Force Air Mobility Command, with Mainsail (general call: any ground station), no joy at 0226. (Cleary-SC) |
| 6959.0 | "Lincolnshire Poacher"-UK "numbers," Cyprus (E03), also on 11545, at 2100. (Boender-Netherlands) |
| 6981.0 | 673DVA-Possible US Department of Veteran's Affairs, sounding in ALE, also on 5038, at 1411. (Perron-MD) |
| 7317.0 | "Edna Sednitzer"-German language "numbers" (G22), in AM at 2209. (Chris Smolinski-MD) |
| 7508.0 | ZSJ-South African Navy, Silvermine, RTTY navigation warnings, also on 13538 and 18538, at 1745. (Hall-RSA) |
| 7527.0 | Omaha 558-US Customs Service, patch via Service Center to Hammer, March ARB, CA, at 2351. (Cleary-SC) |
| 7830.2 | "F-4-L"-US Navy, in a data link coordination net at 1320. (Baker-OH) |
| 7849.0 | Destafac23-Venezuelan Combined Military Forces, Detachment 23, calling VARGAS in ALE, also on 10272, at 0202. CGGN-Venezuelan National Guard, calling Porlamar in ALE, at 2327. (Perron-MD) |
| 8038.0 | GYA-UK Fleet Weather & Oceanographic Centre, Northwood, with a FAX text schedule at 0235. (Jeff Seale-KY) [USB dial freq; assigned is 8040. -Hugh] |
| 8047.0 | H2B-Possibly US Air National Guard Headquarters, Andrews AFB, MD, sounding in ALE at 1326. (Perron-MD) |
| 8103.0 | 4XZ-Israeli Navy, Haifa (M22), 5-letter groups in progress at 0228. (Castillo-Panama) |
| 8140.0 | BNF-Taipai Meteo, Taiwan, FAX weather chart at 2028. (Boender-Netherlands) |
| 8191.7 | 9MR-Malaysian Navy, RTTY traffic for "Exercise Bersama Shield," at 1612. (Hall-RSA) |
| 8240.0 | Cutter Eagle-US Coast Guard Sailing Training Barque, working Coast Guard Group Miami, at 1502. (Cleary-SC) |
| 8337.6 | "X-4-J"-US Coast Guard cutter, working "Y-6-L," "S-7-H," and "I-9-W," all north of Haiti, at 0045. (Cleary-SC) |
| 8416.5 | NMC-US Coast Guard CAMSPAC, CA, SITOR-B navigation warnings at 0230. (Hall-RSA) |

- 8419.5 HEC-Globe Wireless Bern Radio, Switzerland, CW identifier at 0235. (Castillo-Panama) [See June's Digital Digest for info on decoding Globe markers. -Hugh]
- 8424.0 SVO-Olympia Radio, Greece, CW identifier at 0233. (Castillo-Panama)
- 8428.0 NMN-US Coast Guard CAMSLANT, CW identifier at 0237. (Castillo-Panama)
- 8431.5 UAT-Moscow Radio, Russia, CW marker at 0305. (Castillo-Panama)
- 8434.0 TAH-Istanbul Radio, Turkey, CW identifier at 0239. (Castillo-Panama)
- 8861.0 Canarias-Iberia Airlines LDOC, Canary Islands, working flight 6231 in Spanish, at 0138. (Perron-MD)
- 8912.0 Coast Guard 1717-US Coast Guard HC-130, patch via Service Center to Miami Ops, then Clearwater Air, at 2243. (Cleary-SC)
- 8971.0 Red Talon 71C-US Navy, relay to Fiddle via 71B, at 2147. (Cleary-SC)
- 8983.0 Coast Guard 1502-US Coast Guard, relay via CAMSLANT to Cutter Gallatin, went to a secure voice net at 1149. (Cleary-SC) PANTHR-Panther, US DEA Operations Bahamas and Tortugas, sounding in ALE, also on 12138 and 14350, at 1426. (Perron-MD)
- 8992.0 Keflavik-US Air Force HF-GCS, Iceland, with an EAM broadcast at 0946. Sigonella, Italy, EAM at 1902. Lajes, Azores, EAM at 2115. (Boender-Netherlands) Last Date-US military, probably an airborne command post, patch via Offutt AFB, then told operator he was a "heavy" aircraft, at 1919. McClellan-US Air Force HF-GCS, 28-character EAM at 1947. (Haverlah-TX) Navy CW 780-US Navy, patch via Offutt to Brunswick Duty Office, at 2157. (Cleary-SC)
- 9025.0 KWT93-Probably US Department of State, calling KWB48, State Department, in ALE; also tried 11226, 13215, and 15043, at 0924. (Patrice Privat-France) 123-123rd Air Wing, KY Air National Guard, self-identified as "123 Derby TALCE Louisville" [TALCE = Tanker Air Lift Control Element. -Hugh], exchanging a long series of text operator-chat messages with OFF, Offutt AFB, NE, at 1348. (Glenn Blum-TX) Coast Guard 1504-US Coast Guard, ALE-initiated patch to Ice Patrol for an ice report, at 2049. (Cleary-SC)
- 9031.0 Architect-UK Royal Air Force Flight Watch, airfield status reports at 0300. (Perron-MD)
- 9110.0 NMF-US Coast Guard, Boston, weather FAX, also on 12750, at 2148. (Boender-Netherlands)
- 9145.0 CLS-US Army, Fort Campbell, KY, sounding in ALE at 1416. (Perron-MD)
- 9190.0 BNA-Venezuelan Navy, calling CGA, headquarters, in ALE at 1132. (Perron-MD)
- 9215.0 Sierra Foxtrot-US Navy, tactical net with Lima, Charlie, and others, at 2312. (Allan Stern-FL)
- 10024.0 Cenamer-Central America Control, Honduras, calling an aircraft with no joy, at 0132. (Perron-MD)
- 10046.0 4XZ-Israeli Navy, Haifa (M22), CW marker at 0133. (Perron-MD)
- 10242.0 Coast Guard 1502-US Coast Guard, working CAMSPAC and RCC Bermuda, at 0153. (Cleary-SC)
- 10272.0 CGGN-Venezuelan National Guard headquarters, calling MIRA1 in ALE, at 0512. (Perron-MD)
- 10275.0 TA7158-US Army 7/158th Aviation Regiment, calling aircraft R00219 in ALE, at 1323. (Blum-TX)
- 10373.6 CGD9-US Coast Guard District 9, Cleveland, OH, calling NRLY, cutter Bristol Bay, in ALE at 1610. (Perron-MD)
- 10512.0 Unid-"Whale Sound Station" (XM), continuous weird audio-sweep noise at 0424. (Blum-TX) XM, same noise, at 0432 and 2040. (Stern-FL) [This non-harmonic audio mix is very spooky. It's associated with military remote circuits, this time Europe, and possibly the UK Royal Air Force. Parallel on 11363. -Hugh]
- 10720.2 DRAX-German Navy training barque Gorch Fock, clear and secure with DHJ59, Wilhelmshaven, at 0013. (Baker-OH)
- 10790.0 G-BYAK-Britannia flight 588A with a sick passenger, patch via Stockholm to a doctor, at 0920. (Privat-France)
- 10913.7 RFTJF-French Forces, Port Bouet, ARQ-E3 test message at 0731. (Hall-RSA)
- 11202.0 PNR400-Panther 400, DEA, Bahamas, ALE sound at 1331. (Perron-MD)
- 11205.0 Viking 27-US military on joint interdiction operation, working Smasher (Key West, FL), at 0025. (Cleary-SC)
- 11232.0 Rescue 313-Canadian Forces rescue aircraft, patch via Trenton to RCC Halifax, emergency locating transmitter search at 0028. Rescue 313, patch to RCC regarding an icebound vessel, at 2127. (Cleary-SC)
- 11300.0 Tripoli-Atlantic oceanic air control, Libya, getting position from flight 002 at 0045. (Baker-OH)
- 11315.0 TZ0533-American Trans Air, passing HFDL position to Riverhead, NY, at 2122. (Privat-France)
- 11345.0 Northwest 42-Flight enroute to Amsterdam, position for Stockholm, at 0940. (Privat-France)
- 11494.0 60A-US joint interdiction operation, ops-normal and position for Panther (DEA, Bahamas), at 2320. (Cleary-SC)
- 12359.0 VAX 498-"Herb Net" (Herb Hilgenberg, "Southbound II Coastal"), in Ontario, Canada, passing weather information to small vessels at 2020. (Watts-KY) [Herb used to do this net from his vessel, the Southbound II, and the name persists. This is a great frequency to monitor in hurricane season. -Hugh]
- 12700.0 XSQ-Guangzhou Radio, China, CW traffic list and marker at 1730. (Privat-France)
- 13042.2 FUV-French Navy, Djibouti, RTTY test loop at 1751. (Hall-RSA)
- 13089.0 CAMSLANT-US Coast Guard, working Cutter Eagle at 1823. (Cleary-SC)
- 13110.0 WLO-Mobile Radio, AL, voice patch from unknown vessel enroute to Bermuda, at 2035. (Seale-KY)
- 13155.0 Birthday-US military, with a 28-character "hour plus 25/55" EAM, simulcast on 6697, 8992, and 11244, at 2025 and 2055. (Haverlah-TX)
- 13500.0 64B-Venezuelan Navy vessel Los Llanos, calling CGA, headquarters, in ALE at 1033. (Perron-MD)
- 13510.0 CFH-Canadian Forces, Halifax, NS, FAX weather chart at 2013. (Boender-Netherlands)
- 13882.5 DDK6-Hamburg Meteo, Germany, FAX weather chart at 2141. (Boender-Netherlands)
- 13900.0 BMF-Taipei Meteo, FAX chart for India at 2020. (Privat-France)
- 13907.0 Vagabond-US military, working Red Breast and "5926," at 0203. 61A-DEA, working Panther, at 0026. (Cleary-SC)
- 13927.0 Air Force Rescue 14864-US Air Force HC-130, patch via Air Force MARS station AFA1RE, ME, at 2349. (Cleary-SC)
- 14931.7 RFFAB-French military, with a long, ARQ-E3 message in French to many stations from "Comdesorem Paris," possibly an exercise, at 0818. (Hall-RSA)
- 15043.0 PLA-US Air Force, Lajes Field, Azores, passing text string "ADSADFS..." in ALE, at 1256. (Privat-France) [Sure looks like someone just banged on the keyboard to make a test. -Hugh]
- 15094.0 KNY90-US National Communications System, VA, calling KAN38, Federal Communications Commission, KS, in ALE on the SHARES net, at 1606. (Perron-MD)
- 16346.7 Unid-Egyptian MFA, Algiers, relaying a Coq-8 message from Kinshasa, concerning the Congo civil war, at 1530. (Hall-RSA)
- 17441.5 5YE-Nairobi Meteo, Kenya, 100-baud RTTY test loop at 2010. (Privat-France)
- 18003.0 HAW-US Air Force, Ascension Island, passing text string "GHFHJFHJFHJ" in ALE, at 1410. (Privat-France) [Another quick bang on the keyboard? -Hugh]
- 18183.4 7RQ20-Algerian MFA, Algiers, relaying a Coq-8 message from Kinshasa, concerning the Congo civil war, at 1530. (Hall-RSA)
- 18203.7 Unid-Egyptian MFA, Cairo, with an ARQ message in Arabic about the Afro-Asia Legal Union, at 0700. (Hall-RSA)
- 18226.7 kdakrfr-Egyptian MFA, Cairo, ARQ message in Arabic to Khartoum, Sudan, at 1626. (Hall-RSA)
- 19145.7 RFQP-French Forces, Djibouti, ARQ-E3 circuit test at 1208. (Hall-RSA)
- 19724.5 UIW-Kaliningrad Radio, RTTY navigation warnings in Russian, at 1635. (Hall-RSA)
- 23523.0 JMJ6-Tokyo Meteo, weather chart FAX at 1256. (Hall-RSA)
- 25186.0 ASI-UK military, Ascension Island, sounding in ALE at same time as KUW, Kuwait, both at 1506. (Hall-RSA)
- 27870.0 JDGSPR-US Air Force Secure Internet Protocol Router Network entry point, Diego Garcia, ALE sounding at 1317. (Hall-RSA)

Tunisian Diplomatic Service and 4XZ

This month we feature the signals of MFA Tunis and its various embassies. These stations make a great catch for listeners during the summer months in North America, and year round elsewhere. No complicated gear is required, as standard SITOR-B is used.

❖ Wobbly Transmissions?

Probably the most distinctive feature of MFA Tunis is that it has, for at least the decade that we have been listening to it, a defective transmitter or modem. The effect of this instability is to cause the tones to “wobble” giving the station a bizarre and very recognizable sound wherever it appears. I have yet to come across any other station that sounds like it.



As we mentioned in the introduction, good propagation in late afternoon and early evenings during the summer months in North America make hearing this station a distinct possibility on their 13MHz and 18MHz channels. The station is most often heard on 13956.5kHz and 18571.5kHz. In Europe, some of the lower frequency channels like 6901.5kHz may be active during the mornings for shorter range communications. MFA Tunis has been logged on the following frequencies:

6901.5 8846.4 13941.5 13956.4 13956.5
18571.5

It has also been reported on the following channels.

2755.0 2855.0 2983.0 3030.0 3131.0
3831.0 3838.0 4439.0 4755.0 5260.0
5370.0 5371.0 5533.0 6741.8 6770.0
6868.0 7711.0 7766.0 8195.0 13914.0

Unlike a lot of other diplomatic operations that take the weekend off, the Tunisians can sometimes be heard on either Saturday or Sundays.

French is used for keyboard-to-keyboard chatter, and it is not unusual for the operators to revert to CW when the going is particularly bad.

❖ Distinctive Operations

Unusually for a diplomatic operation, the Tunisians employ daily-changing tactical three letter or mixed letter-number callsigns for both MFA and outstations. The Tunisians also have a distinctive call-up style when summoning em-

bassies. A station “LDO” calling station “MCO” would be rendered something like:

LLLLLLLLLLLLDDDDDDDDDDDDOOOOOOOOOOO
de de de MMMMMMCCCCCCCCOOOOO

Most traffic is off-line encrypted traffic in 5-letter groups, with double linefeed. In 1999, a new style of message header, still using off-line 5-letter groups, appeared and uses the keyword “vci etoile” (here is star?) followed by the string “mnmnm”. Here’s a typical exchange between stations and the start of coded traffic:

bien reçu bien reçu ????? kkkkkkkk
pse ajoutez “inter ligne” avant la signature
mci kkkkkkkk
ssssssffffffppppp de lllllnngggg
zczc
90033

/////
fuand qglej gtubd eodep kszej xkjl eetqj nnaoo
evrdp qkggy
wuerc poufr suusp ghuqq galep mgufr mvwvf
kyehw eoaaw wummr
etc etc
+++++
nnnn

The new-style traffic is sent as follows:

jta jta jta jta jta jta de qoo de qoo vci
etoile
mnmnmn
kdwnw ebzeu guniy ddweb kukpn zpydk gdzbb
kptnk egumu zbedb
mnnnti rraaw zakik ukmyb twagy piztm wgwmmk
rnbtu bayiy idgda
mbtky mbntz nggwd raapi gezbd ttumk ianap
gzgpn mngyb zneey
etc etc
nnnn

All traffic is sent using standard 100bd, 170Hz shift SITOR-B in SBRS (selective station mode) which means that most decoders will be able to listen to MFA Tunis.

Make sure you give Tunis a listen. With so many years using this simple equipment, it may not be long before they make the transition to more modern gear.

❖ The Israeli Navy’s 4XZ

For some time, the Israeli Navy’s CW station in Haifa was considered an espionage “numbers” station until renowned monitor Day Watson noticed that the five letter group traffic was in fact an obscure World Meteorological Organization weather coding system. Despite



this proof of 4XZ’s legitimacy as a regular utility station, it is still sometimes logged as a numbers station.

Our coverage of this station is prompted by the usual shuffling of frequencies that happens in the early spring and fall months. The station has a habit of maintaining a number of long-term channels augmented by the one or two new ones during this twice a year “migration.” This spring, 4XZ added a very odd pair for a few days when both 13511 and 13514kHz were active simultaneously. At the time of writing (mid-May) only 13511 remains active. The current long-term channels are as follows:

2680 3394 4331 6379 8103 10046
12984 and 17050 kHz

Most of these channels are constantly active, 24 hours per day.

When not sending messages (usually in five-letter or five-number groups) the station sends a simple marker of “V V V DE 4XZ 4XZ BT BT.” Messages begin with a header like “ar ar nw qtc 1 nr 123” where 123 is the message number to follow. Messages are usually repeated with the header “ar ar nw rpt nr 123.”

❖ New Propagation Beacon

The UK’s national body for Radio Amateurs (RSGB) has recently put a new propagation beacon on the air. These useful stations help radio amateurs and others judge the prevailing conditions of the ionosphere and are often used on a more long-term basis to study radio propagation.

The new beacon, callsign GB3RAL, is now operational (mid-May) using a temporary aerial awaiting a more permanent aerial installation. The beacon transmits every 15 minutes on Channel FC (5290 kHz), based upon the hour as a starting point.

The beacon sequence sent is a callsign followed by a long tone at full power and then 9 power steps each -6dB (a four times decrease in power) relative to the last. The power steps are repeated twice and then there is a 30 second sounder sequence of 0.5mS pulses at 40Hz PRF (pulse repetition frequency).

Listeners in the eastern part of the US may well be able to hear the new beacon during the evening hours.

That’s it for this month. Good luck and good (digital) DX.

Radio Mexico Internacional Finally Closes Down

Radio Mexico Internacional, XERMX-OC, 9705, 11770, went off the air June 1. "There is nothing left to do but thank everyone who listened to us, our deepest gratitude on behalf of those who worked here," wrote Lic. Oscar E. García via Héctor García B., DF, in *Conexión Digital*.

11770 had been silent for months; the final loggings of 9705 were on UT June 1: 0205 by Manuel Méndez, Spain, *Cumbre DX*; 0338-0431 by Mickey Delmage, AB, *DXLD*; and 2220-2231+ by Harold Frodge, MI, *Cumbre DX*.

More about this via Héctor García Bojorge, DF, *Conexión Digital*: On May 26, APRO reported that IMER had closed its stations in Campeche and Colima, saving four megapesos, and two more would be saved by closing RMI after May 31, to the objections of the IMER workers' union. Meanwhile, IMER was paying 8.5 kilopesos monthly rent on unoccupied office space for XERF in Ciudad Acuña.

IMER was also denounced for lack of glasnost in justifying the closure of XERMX. There were only unofficial accounts in the press, alluding to SW being obsolete, Internet being the latest thing (tho XERMX has never streamed and still does not), and to save the two megapesos, complained Fernando Mejía Barquera, in *Milenio Diario*. DXers such as Dr. Julián Santiago Díez de Bonilla, who used to produce a program on RMI, are concerned that Mexico will lose its rights on 9705 and 11770, so RMI should be declared "inactive" rather than "disappeared"; or if nothing else, the two 10 kW transmitters and frequencies should be turned over to stations still interested in shortwave, XEYU, inactive on 9600, and XEXQ, low power on 6045.

Roberto Edgar Gómez Morales wrote *DXLD*: I visited the site and found the antennas still standing; there were five transmitters, 1 x 100 kW, 1 x 50 kW, and 3 x 10 kW – but one of the latter had been destroyed a few weeks ago by someone with a hatchet so it could be sold as scrap metal.

Fire At Radio Habana Cuba

An electrical fire raced through an old six-story building housing four major state-run radio stations, forcing all off the air as firefighters with long ladders evacuated scores of workers. There were no deaths or serious injuries, but several people were treated for scrapes and smoke inhalation. The building was still standing after the flames were doused, but the extent of the fire and smoke damage inside was unknown.

Fire Department Col. Mario Álvarez declared the cause of the 9 a.m. May 27 blaze to be electrical. Other officials said that a short circuit apparently sparked an oil leak when workers were performing maintenance on an air conditioning system. The stations forced off the air were Radio Habana Cuba on SW; Radio Progreso; CMBF, and Radio COCO, per AP via Mike Cooper.

RHC had to suspend most of its language broadcasts for the next few days, maintaining some in English and Spanish only, Célio Romais, *Conexión Digital*, found out from an RHC Portuguese staffer. It was the Radio Progreso building, and José Elías, Venezuela, found this illustrated report: <http://www.radioprogreso.cu/despliegue.php?de=reportero&idti=3276>

ARGENTINA RAE went off the air May 13, when vandals stole the coaxial cables connecting the studio to the transmitter in General Pacheco, and returned by May 19. This did not affect relays of R. Nacional on SW, which uses a wireless link (Gabriel Iván Barrera and Rubén Guillermo Margenet, *Conexión Digital*)

AUSTRALIA The Australian reports that a parliamentary inquiry into Australia's relationship with Indonesia is urging increased funding for RA so it can resume full-scale SW to Indonesia. Seven years ago, federal budget cuts resulted in the controversial closure of the Darwin shortwave site, forcing RA to stop broadcasts to Indonesia and downgrade coverage to other parts of Asia. The transmitters were later sold, and the site leased to the Christian evangelical broadcaster Voice International. RA now leases 10 hours a day of airtime from VI, which says that it has the capacity to offer much more airtime at competitive rates. RA says that in the 1970s and 80s, its Indonesian audience was estimated at 20 million and is now down to about 5.4 million (Andy Sennitt, *Media Network*) See also NEW ZEALAND [non]

Wyndham-East Kimberley Shire president Barbara Johnson said planning approval was granted in a 6-3 vote for 31 new radio towers to be built just outside Kununurra, in the far north of WA. HCJB currently has three towers. HCJB's Kununurra manager Mike Moore said gaining planning approval for the 31 towers had been an "agonizing" process that began seven years ago when HCJB first bought land in Kununurra. More than 800 of Kununurra's 5500 residents unsuccessfully petitioned against the original development, with some citing fears of a backlash from Muslim countries in which the Christian programs were broadcast. The necessary land still had to be acquired from the state government (Holly Nott, *Sunday Times* via Artie Bigley, Alokesh Gupta)

HCJB-Australia is also obliged to fulfill additional conditions, which include the carriage of news broadcasts from ABC National Radio and Radio Australia, programming about health and well-being, and material covering learning and education. Those conditions were contained in the original license application, to support its request, and are not commonly known.

Due to design limitations, the exist-

ing antennas cannot operate on bands other than 11 or 15 MHz, and when used on 15 MHz, power is limited to 75 kW (Bob Padula, Mont Albert, Victoria, Australia) Has HCJB-Australia actually been carrying news from RA/ABC, and the other programs as required? Did not see any mention of such on their schedule (gh) Glenn, As far as I know, HCJB-Australia is not carrying ABC programming, at least not on a regular basis (Bob Padula, *DX Listening Digest*)

HCJB greatly changed its schedule effective May 30. The evening release to South Asia, and all broadcasts in Hindi, Urdu and other South Asian languages were suspended until 28 August. *DX Partyline* rescheduled to Sat 0730 on 11750, 1100 on 15425, 1230 on 15435. Dennis Adams explained why: due to sunspot activity and limited antennas preventing us from going below the MUF to South Asia in the evening. But the engineers have built a new antenna for East Asia during southern winter (Glenn Hauser, *DXLD*)

Revised schedule in English: 0700-1000 11750 50 kW 120 degrees; 1000-1200 15425 100/307; 1200-1430 15435 100/340; 2230-0100 15525 100/340; 0100-0230 15560 100/307 (via Alokesh Gupta, New Delhi, India, *DXLD*) It is proposed to commence new services to Asia on August 29 at 1230-1500 on 15405, and 1500-1730 on 15390 (Bob Padula, *EDXP*)

BANGLADESH Bangladesh Betaar new E-mail: rrc@dhaka.net (Alokesh Gupta, India, *World of Radio*) Website: <http://www.banglaradio.com> English: 1230-1300 S&SEAs 7185 60 degrees, 9550 140 degrees; 1745-1815 V. of Islam to Eu 7185 and 9550 320 degrees; 1815-1900 Eu 7185, 9550, 15520, all 320 degrees (Swapan Chakraborty, *WWDXC*)

BOLIVIA New SW station on 5500.00, R. Virgen de Remedios, Tupiza, Sud Chichas Province, Potosi Dept., from late May with Catholic programming from Radio Católica Mundial network until close varying around 2230 (Rogildo F. Aragão, *Conexión Digital*)

6025, Radio Illimani is back on the air! 0010-0020 May 31, taquirari music, "Red Illimani - 70 años"; worse than in 2002. Less power? (Artiom Prokhorov near Moscow, Russia, *Cumbre DX*) E-mail from the director general, José Luis Almanza, says they returned to the air thanks to Canadian government aid, reviving their old 10 kW transmitter which had been off

All times UTC; All frequencies kHz; * before hr = sign on, * after hr = sign off; // = parallel programming; + = continuing but not monitored; 2 x freq = 2nd harmonic; A-04=summer season; [non] = Broadcast to or for the listed country, but not necessarily originating there; u.o.s. = unless otherwise stated

more than two years. Invited recordings so they could judge how well they are getting out (Jan Edh, Sweden, *dxing.info*) Excellent during window free of QRM from 2330 to 0100, but very boring; never heard "Illimani", just La Voz de Bolivia at 2345 (Jan Edh, Ronny Forslund, Sweden, *SW Bulletin*)

BRAZIL 6945.11, at first unID, at 0958, 1015; Rogildo Aragão says it is Radio Rio Mar, Manaus, Amazonas (Björn Malm, Quito, Ecuador, *DXLD*)

BURMA [non] Because of China appearing on 17490, Democratic V. of Burma via Madagascar at 1430-1530 changed from 17495 to 17625 (*Media Network*) Marginal, very weak here (Zacharias Liangas, Greece, *DXLD*)

CANADA RCI added more transmissions for SE USA June 21 (Bill Westenhaver) Looks like a lot more French than English. New in English is 1900-2200 on 17765 250 kW, 227 degrees: M-F 1900-2100 *The Roundup*, 2100 *World at Six*, 2130 *As It Happens* (1/3 of it); Sat 1900-2200 *DNTO*; Sun 1900-2000 *Tapestry*, 2000-2200 *Cross Country Checkup*, all CBC programs, most not on SW before. Now there are two complete runs of *W@6* and *AIH* at 2200-2400 and 0000-0200 weekdays, and various CBC/RCI features on weekends (Glenn Hauser, *DXLD*)

COLOMBIA FARC clandestine, Voz de la Resistencia had not been heard for a very long time, but was heard UT June 1 at 0030 on 6239.83 celebrating the 40th anniversary of FARC; and again June 10 at 0000 on 6239.83, this time // 6120 (Björn Malm, Quito, Ecuador, *DXLD*) Also June 8 at 0037 on 6239.8, revolutionary march, no ID, and jammer (Björn Fransson, Sweden, *SW Bulletin*) Article mentions jamming, photo: <http://www.cromos.com.co/actualidad2.htm> (Henrik Klemetz, Sweden, *DXLD*)

Harmonic: 4770, Ecos de la Miel, Samaná, 1590 x 3 at 2210-2300 with refrigeration ad, "En su casa, en su negocio, en su sitio de trabajo; estás escuchando lo mejor, Ecos de la Miel" (Rafael Rodríguez, Bogotá, Colombia, *Conexión Digital*)

CUBA RHC in English with targets: 2030-2130 11760 NY, 9505 Antilles; 2300-2400 9550 Caribbean; 0100-0500 9820 Chicago, 6000 Washington; 0500-0700 9550 and 9655 Caribbean, 9820 Pacific. Esperanto, Sundays only: 0700-0730 9820 Pacific; 1500-1530 & 1930-2000 11760 NY; 2330-2400 9600 & 9505 America (Lourdes López, RHC via Dan Sampson, *Prime Time Shortwave*)

[non] R. Martí programming: http://www.martinoticias.com/rm_sch_spa.html R. Martí frequencies: <http://www.martinoticias.com/frequencies.htm> (Oscar de Céspedes, *Conexión Digital*)

DENMARK World Music Radio, 5815, 0215-0315+ in late May, US/Euro-pops, "WMR" IDs, E-mail address. Multi-lingual announcements. Fair, but totally covered by unID QRM at 0230-0241. A regular (Brian Alexander, PA, *DXLD*) Antenna used on 5815 is a dipole at about 24 metres high directed East-West (Stig Hartvig Nielsen, WMR, *DSWC DX Window*) Dipoles for 5815 and 15810 kHz are not very far apart from each other and radiation from both aerials were affected. So we changed the direction of our 15810 dipole and hope reception has improved in the prime coverage area beyond one megameter from Denmark (Stig Hartvig Nielsen, WMR, *Media Network blog*)

ECUADOR La Voz de Riobamba, presumed on 3450, 1150 x 3, at 0330-0400 with Ecuadorian pop music typical of this station (Rafael Rodríguez, Bogotá, Colombia, *Conexión Digital*)

[non] WRMI will start carrying *DX Partyline* from late July or early August; and a monthly NASB report will be on *DXPL* (Allen Graham, HCJB *DX Partyline*)

EQUATORIAL GUINEA R. Malabo, 2227 on 6251.0, drifting down to 6249.8 by 2307*, heard on a regular basis; light Spanish ballads, 2304 sign-off with national anthem (Scott R. Barbour, Jr., Intervale, NH, *DXLD*)

GREECE VOG's mailbag show *O Tahidromos* (meaning Mailman) takes phone calls and answers letters from listeners, now scheduled Mon, Wed, Thu and Fri at 1230 on 15650; tho presented in Greek by Natasa Vissarionos and Soula Bassiouka, letters arriving in English are also accepted and read (Marcelo Vieira, Paraná, *Panorama*, @*tvidade* DX) Also on the huge Delano relay 9690?

GUATEMALA R. Verdad heard again in late May, 0320-0320, reactivated; said transmitter problems had been solved, asked for reports, ID even in Japanese; good signal but low modulation (Elmer Escoto, Honduras, *hard-core-dx*) On 4052.47, at 0109-0302 with mostly religious music, announcements, testing. Station secretary had E-mailed me, "Radio Verdad just went on the air, but with only one module because the other worked well only five minutes and broke again. Our power today is from 280 to 300 Watts." (Dave Valko, PA, *Cumbredx*)

GUIANA FRENCH For at least six days straight in mid-June, something very wrong with an RFI transmitter here: big motorboat buzz on 15515 in French from before 1300 until 1359* \ 17860 had no such problem. Was no one paying attention at Montsinéry? It was so loud I could barely make out the "RFI" ID in passing (Glenn Hauser, OK, *DXLD*)

HONDURAS As of early June, HRMI had been inactive on both 3340 and 5010. A few months before that, the station reactivated and I spoke with the director, who even talked about producing a short program (with yours truly) in English, destined for DXers and SWLs abroad. But HRMI went off the air again a few days after that. I have tried talking to the director again, but the cellular number he was using has been assigned to someone else. The failure seemed to be a faulty tube, from what he said at that time. Their antenna was a simple dipole (Elmer Escoto, San Pedro Sula, Honduras, *DXLD*) Same organization has had a CP for KIMF SW in New Mexico for several years (gh)

IRAN Ayatollah Ali Khamenei has promoted Ezzatollah Zarghami, 45, to head of

Islamic Republic of Iran Broadcasting (IRIB) where he had been deputy head. Zarghami was among militant students who overran the US Embassy in Tehran in 1979 and held 52 embassy staff hostage for 444 days. He joined Iran's elite Revolutionary Guards as a senior officer in the early 1980s and served for a decade there. IRIB enjoys a monopoly over Iranian broadcasting. The international service produces radio programs in 25 languages. Khamenei appoints the head of IRIB and other key officials (Andy Sennitt, *Media Network blog*)

ISRAEL Kol Israel schedule shifts one UT hour later Sept 22. Until then, English: 0400-0415 11590 15640 17600; 1010-1020 15640 17535; 1700-1715 15640 17535; 1900-1925 15615 15640 17535. From Sept. 1, 15640 is replaced by 9435 at 0400 and 1700; and by 11605 at 1900 (Observer, Bulgaria)

ITALY [non] IRRS' transmitter in Romania? IRRS seems to be surprisingly secretive about the location of their 100-kW transmitter. On the schedule at 1900-2000 on 5775 is Reformed Bible Church of Southern California.

From that church's site <http://www.reformedbiblechurchsc.com/> "Pastor Chomppf can be heard on NEXUS-International Broadcasting Association, with transmitters in Romania, reaching all of Europe, Middle East and North Africa. They are broadcasting our programs on Friday evenings from 9:00 to 10:00 PM Central European Time on 5775 kHz." (via Sergei Sosedkin, IL, *DXLD*)

At last, somebody let it slip! Also – see WESTERN SAHARA [non] – Cotroneo suggests a remote receiver in Rome as a good one to monitor 15665 – surely this would not be the case if 15665 were actually in Milano; too close, skip zone, but OK for Romania beaming across Southern Europe toward West Africa (gh)

I would rather think that somebody confused "Italy" and its capital "Rome" with "Romania." Website does not mention that NEXUS is an Italian provider (Bernd Trutenau, Lithuania, *DXLD*)

The schedule at http://www.nexus.org/NEXUS-IBA/Schedules/IRRS-SW_A04.html shows A3, i.e. "ordinary" AM with full carrier, as mode for all IRRS transmissions. No more USB with reduced carrier as was always the case with the Siemens communications transmitter they operated from some farm in Italy. I assume that this installation is history now and all transmissions originate from elsewhere, and why not from Romania; if so Saffica would be a site with equipment matching the given output levels of 20 and 100 kW (Kai Ludwig, *DXLD*)

One evening at 1945 I was tuning 5775 and heard only a loud hiss on the carrier. This reminded me of what we have been hearing on RRI (Romania) frequencies from time to time, so maybe Romania is indeed the actual origin of the current IRRS transmissions as suggested. What speaks against is the fact that the signal is always fluttery (slow flutter) at my location. Normally signals from the Balkans are rather stable. The IRRS signal usually stays between S-7 and S-9. The modulation of the 100 kW transmitter is somewhat low and that suggests the Saffica site if we look at Romania. The lower power transmitter is heavily modulated and when the carrier fades down a little the audio immediately becomes distorted. Currently the signal has both sidebands equally strong (Olle Alm, Sweden, *World of Radio*) For 5775, IRRS claims the lower power 20 kW throughout the week except for Fridays (100 kW). (Bernd Trutenau, *DXLD*)

KOREA NORTH V. of Korea heard on five occasions on 21420 = 3 x 7140 at 2200 in Chinese (Kelvin Brayshaw, Levin, New Zealand, *NZ DX Times*)

LIBYA Guido Schotmans and I heard an unID Arabic station on 11180 usb at 2128-2159* Silvain Domen, Belgium, *DXLD*) Talks and music in Arabic, targeting the "People of Iraq." Next day at 1830 I checked 11180 against the reported Libyan frequencies to Iraq, 9745 and 11660. Found the parallel program on both of these two channels. Mode is AM/USB with more or less suppressed LSB/carrier (Jari Savolainen, Kuusankoski, Finland) 11180-USB is an unannounced frequency for the Libyan transmissions to Iraq // 7425 11660 11890 at 1800-2200 (DXA375-Silvain Domen, Belgium) 11180 is a new frequency and they never announce it in the list by the end of the transmission (Tarek Zeidan, Egypt, *DXLD*) 11180-USB replaced 11890, at 1203-1303, 1803-1903, 2103-2203, all \ 9605 9745; 1603-2203 also on 11660 AM (Observer, Bulgaria) Is their clock 3 minutes off? (gh) In April 1984 I logged a now long-gone clandestine station "Voice of the Free Sons of South Yemen" on 11180, from Sudan or Libya (Chris Greenway, Kenya)

NEW ZEALAND The government is to purchase a new \$2.7 million digital transmitter for RNZI. While broadcasting mainly in English, it also carries news in seven Pacific languages, making it one of the most listened-to stations in the South Pacific. Broadcasting Minister Steve Maharey made the announcement. "The current 15-year old analogue transmitter is nearing the end of its serviceable life. Funding has been secured to replace the transmitter in 2005. It will operate alongside the current analogue transmitter for a period of several years, and then replace it completely. SW broadcasting remains the best possible way of reaching a large area with a reliable signal, at a low cost. The new transmitter will provide a vastly improved, high quality signal to the fourteen Pacific radio stations that rebroadcast RNZI news and programmes every day." (government press release via Ullis R. Fleming, *Cumbre DX*; Barry Hartley, NZ, Wolfgang Büschel, *BC-DX*)

From May 30, R. Australia began relaying RNZI with *Pacific Dateline*, UT Sun-Thu at 2130, consisting of a 6-minute news bulletin and the *Dateline Pacific* program that goes to air on RNZI a few hours earlier. It's the first part of a new RA initiative to set up a "Pacific Broadcasting Network" (John Figliozzi, *DXLD*) 15515 now heard with this (Bernie O'Shea, Ontario, *DXLD*)

PAPUA NEW GUINEA Catholic Radio Network's SW transmitter on 4960, mentioned in the past two columns, went on the air June 4. Assessment was also

Shortwave Broadcasting

being made of the 3200-3400, 90 mb for possible operations should 60 mb prove unsuitable for nearby coverage (Bob Padula, Melbourne, Australia, *World of Radio*) 4960, CRN, first noted June 4 at 0958-1300, Catholic prayers, 1029 and 1040 with Vatican Radio IS, again at 1059 and clear ID by female "This is the Catholic Radio Network of Papua New Guinea." Subsequently fade in at 0730, fair to good by 0935, blocked by Ecuador from 0954 and then by noise, in the clear from 1242, peaking at 1315, an hour past local sunrise, still audible at 1400 (Guy Atkins, WA, *Cumbre DX*)

This is 1 kW to a POD330 vertical incidence Delta antenna. The station does not wish its SW service to be regarded as a "radio DX hobbyist target" and does not have the capability to process and issue formal QSLs. Later: CRN will handle all requests for QSLs and info, news@rtapng.com.pg (Bob Padula, Melbourne, Australia, *DXLD*) Program schedule, subtract 10 hours for UT, has lots of Vatican and EWTN: <http://www.catholicpng.org.pg/crn/Sunday.html> (gh) Virtually inaudible after June 6; maybe adjusted antenna (Walt Salmani, BC, *DXLD*)

NBC is taking back control of the 19 provincial 'Kundu' radio stations. This, according to the managing director Dr Kristoffa Ninkama, is to save the provincial network from total collapse (Kevin Pamba, *The National*, PNG)

POLAND R. Polonia, 11820, *1159-1215, English, IS, sign-on, brutal audio quality and bad transmitter hum but a clear "This is Radio Polonia, broadcasting from Warsaw." Signal gradually improved; I assume the signal got better as the transmitter warmed up? (Scott Barbour, NH, *DXLD*)

SUDAN [non] Sudan Radio Service, an independent provider of balanced news and information to the people of Sudan living both in Sudan and abroad: 0300-0500 on 11665, 0500-0600 on 15325, 1500-1800 on 17660 from Monday to Friday. Address: c/o EDC, Inc., P. O. Box 4392, 00100 Nairobi, Kenya. E-mail: srs@edc.org (via Masato Ishii, Japan, *DSWC DX Window*) 1500 is a repeat of the 0300; added website with daily audio files: <http://www.sudanradio.org> (Chris Greenway, Kenya, *World of Radio*)

SYRIA [non] The Reform Party of Syria announced that the first ever pro-Democracy grassroots based "Radio Free Syria" (RFS) would begin June 20, Sundays 1800-1900 on 13650. Intent is to build up to 5 hours daily by December 2004 (<http://www.radiofreesyria.org> via Bernd Trutenau, Lithuania, *DXLD*) Israeli press implied the 13650 site is Cyprus, but this is unlikely propagationally (gh) Site is DTK Jülich, Germany, 100 kW, 120 degrees (Observer, Bulgaria)

U K [non] As previewed last month, R. Ezra's latest series of weekly broadcasts started June 6, Sun 0900-0930 on 17490, via Armavir, Russia, 250 kW, 290 degrees (Observer, Bulgaria) But in the meantime, China had started up on 17490, so by June 13, Ezra shifted to 17590 (via Dan Sampson, Silvain Domen, *DXLD*) Strong and clear there, What is Karaism feature, music from the Ashdod Community Choir in Israel. Will run for 13 weeks, address Radio Ezra, P.O. Box 674, Stockton on Tees TS18 3WR, United Kingdom. They can also be contacted via <http://www.radioezra.com> (Mike Barraclough, UK, *DXLD*)

UNITED NATIONS [non] UN Radio, M-F in English 1730-1745 7150-South Africa, 15495-UK, 17810-Ascension (Marcelo A. Cornachioni, Argentina, *Conexión Digital*)

U S A Since Rush Limbaugh condoned and trivialized the Abu Ghraib prison scandal, a petition campaign was mounted to get him off AFRTS (gh) U.S. Senator Tom Harkin (D-IA) announced that he successfully amended the 2004 Defense Authorization bill to help ensure that AFRTS fulfills its stated goal of providing political balance in its news and public affairs programming; the service carrying Limbaugh was not balanced (Sen. Harkin's website via Kim Elliott)

World Harvest Radio programming first heard over WSHB, June 5 at 0420, ID as such at 0500 (Jim Moats, OH, *DXLD*) It was announced two months earlier that WSHB had been sold to an unidentified buyer; meanwhile it had been silent (gh) On the new posted schedule, some of the frequencies were from WHRI, others previously used by WSHB, still labeled only "WHRI", after some adjustments as of June 22:

WHRI Angel 1

0000-1000 7315
1000-1300 9495
1300-1700 15105
1700-2200 15665

2200-0000 9495

WHRI - Angel 2

0000-1300 7535
1300-1500 11670
1500-2100 13760
2100-0000 13770
2200-0000 M-F 9430

Of these, 15665, 7535, 11670, 13770 and 9430 were once used by WSHB. IDs heard on air were "World Harvest Radio International via WSHB", not "WHRI" (gh)

A few days later, The First Church of Christ, Scientist, in Boston, Massachusetts announced the impending sale of WSHB, South Carolina, to LeSEA Broadcasting Corp. The \$2 million sale would take place once the FCC has completed its review of the agreement. "We're especially delighted that LeSEA has agreed to keep most of WSHB's excellent staff onboard," said Catherine Aitken-Smith, Broadcast Director of Broadcast and Multimedia Services for the Church (via Mauno Ritola, *Cumbre DX*) Station officials told *Radio World* in 2002 that WSHB cost \$19 million to build but that the asking price at that time was \$6.5 million (*Radio World Newsbytes*, via Bob Padula,

EDXP)

WSHB's two 500-kilowatt transmitters (which will be operated at 250) have joined the five existing SW transmitters operated by LeSEA. "WHRI is presently off the air and all programming is now on WSHB," according to LeSEA's Director of Engineering, Larry Vehorn (*NASB Newsletter*) Apparently WSHB will be renamed WHRI and the Indiana facility is decommissioned. Remember that WSHB (and WGSN/WVHA/WHRA) were originally 500 kW transmitters. I'll bet WSHB is not being run anywhere near that now, and WHRA sounds like about 100 kW; the old WHRI would be lucky to put out 25 kW, difficult to hear in Europe. Just what WHR needs to keep from fading into oblivion – until WSHB breaks down. Then it would probably be too expensive to fix (Glenn Hauser, *DXLD*)

KTBN, 7505, was heard announcing at 1230 June 8 that they are in danger of going off the air, and were requesting contact by E-mail, phone or postal mail from listeners in any part of the world; otherwise, they will leave the air due to lack of listeners (Adrian Peterson, IN, *BC-DX*)

Still there, as of June 22, and daytime channel 15590. Shhhh, don't pretend you really want them to stay on with TBN. Either silence or sale to almost any other broadcaster would be an improvement. Hey, why not bring back a rock station like KUSW? It finally dawned on TBN Santa Ana HQ that there's not much point in simulcasting their TV audio delivered by satellite to dozens of transmitters (many full power) in the US, and abroad. KTBN is not a real radio station, just a transmitter site with an old vapor-cooled Harris SW-100, quite similar to the ones at WHR Noblesville, but apparently in much better working order. Might have been useful for parts if WHR weren't already moving operations to Cypress Creek. The land upon which KTBN sits is probably worth several megadollars in Salt Lake's growing real estate market, so just scrapping the transmitter might be the most cost-effective option. You may recall when TBN purchased KUSW, they put out all kinds of hype about how the SW station would help save souls all over the world. Trouble is, KUSW was engineered basically to cover North America, with high takeoff angle and broad beam. Combined with its location on the wrong side of the Mississippi, coverage of Europe is pretty much limited to those with DX equipment, the signal peters out by Africa, and it was never aimed at Asia or Pacific where it might have a better chance (Glenn Hauser, OK, *DXLD*)

World of Radio is to be carried on WRMI from August, along with *DX Partyline* (Jeff White, WRMI) WOR resumed on WJIE, 13595, M-F at 2100 (Morgan Freeman, WJIE) WBCQ times for WOR: Wed 2200 7415, 17495-CUSB; Sat 2000 9330-CLSB, 2030 17495-CLSB, Mon 0100 9330-CLSB, 0430 7415.

The hour previously occupied by *A Different Kind of Oldies Show* on WBCQ, 7415, UT Sun 0000, morphed in July into "The Peacock Project", independent producers rotating, including *Golden Age of Oldtime Radio*, *The Voice of Savage Henry* – Garage Rock; *Downunder DX* and *MusicFest* with Aussie Tim Gaynor; and *DKOS* – Doowop, in that order, subject to change (Tim Gaynor, Queensland, *DXLD*)

WWRB update – We are sending out our listener club certificates by the 'bushel basket'! These are our QSL card. Reception reports to WWRB, Box 7, Manchester, TN 37349. Please, all reports by land mail! We no longer fool around with E mail as we get 1500 to 2000 spams a day. We do not have time to sort them so we are turning off our e mail (Dave Frantz, WWRB, *DXLD*)

Voice of the NASB: we have decided to broadcast in DRM to North America via RCI-Sackville, 1700-1730 UT Saturday on 11900. Start date has not been set yet, sometime after mid-July (Jeff White, *DXLD*)

[non] United Methodist Church, Radio Africa International cancelled all transmissions via DTK T-systems Germany (Observer, Bulgaria) Just a year ago, a new webpage for RAI was promoted, <http://www.umradio.org> but now it just leads back to the GBGM index page (gh)

WESTERN SAHARA [non] On Friday May 14, Ehard Goddijn at Radio Nederland monitoring discovered a new service called Radio for Peace, at 1140 on 15665 in Spanish, via IRRS Nexus, Milan, Italy, with an English ID and request for reports at 1200 (Andy Sennitt, *DXLD*) The NEXUS schedule shows it Fridays only, website: <http://www.radiokcentrale.org/radio4peace.htm> (Bernd Trutenau, Lithuania, *DXLD*) That reveals it's for and about Western Sahara. Since the broadcasts are in Arabic and Spanish, and the explanation is in Italian, why is the name of the program in English? The audio links in Spanish Cannot Be Found, unlike Arabic, which, however, has opening in Arabic, Italian-accented Spanish, Italian, and heavily-accented English, "Free Waves in the Desert... of the Saharawi equal rights, broadcasting project for the promotion of the human rights project of the Western Sahara People". Says the schedule since April 2 is Fri 1100-1200 on 15665 [100 kW], repeated Sat 1900-2000 on 5775 with 20 kW (but the NEXUS schedule says 1930-2030) It originates at Radio Kappa Centrale in Italy. Contact: radioforpeace@libero.it (Glenn Hauser, *DXLD*) Try this to hear it: <http://www.webradio.rai.it/> (Alfredo Cotroneo, IRRS, *Cumbre DX*) via ROMANIA? See ITALY [non] for discussion of IRRS' secret site

ZANZIBAR 6015, R. Tanzania Zanzibar, 0300, Swahili opening announcement and Qur'an recitation after National Anthem and pips on the hour, clear frequency (Martien Groot, Netherlands, *DSWC DX Window*) But inactive on 11734.1 where it used to be heard around 1900-2100 (gh)

ZIMBABWE [non] VOA reshuffled "Studio 7." Instead of M-F it is now aired daily 1700-1800 on 909 Botswana, 17895 Morocco, 11975 São Tomé, in three languages: 1700-1720 Shona, 1720-1740 Ndebele, 1740-1800 English. Address: VOA, African Division, Studio Seven, 330 Independence Ave. SW, Washington, DC 20237, USA. Email: studio7@voanews.com (VOA via Bernd Trutenau, *DXLD*) Zimbabwe applied diplomatic pressure upon Botswana about the MW 909 relay, and Botswana pretended to be surprised to hear of

0055 UTC on 11800

ITALY: RAI. National news to station identification. (William McGuire, Cheverly, MD) Report on Italian-Argentine relations 11800, 0058 / 9675. (Bob Fraser, Belfast, ME) Italian service 9840, 0010. (Louis R. Weaver, Houston, TX)

0106 UTC on 9665

RUSSIA: Voice of. News item on Russian military. *Music and Musicians* segment 12070 // 15455 at 2015. (Fraser, ME) **TWR** relay via Irkutsk 9485, 1230-1245. (Arnaldo Slaen, Buenos Aires, Argentina) **Russian Int'l Radio** 7125, 2347-0011. Russian text to pop and dance music. News bulletins and numerous "Russkoye Mezhdunarodoyne Radio" IDs. Booming signal quality via DTK Juelich, Germany relay or Russia? (Barbour, NH)

0120 UTC on 15695

TAJIKISTAN: Radio Free Asia. Chinese. Male/female announcer duo's text and traditional Chinese music. SINPO 44444. (Mirabal, PR) Burmese/English 15680, 1339 including "This is Radio Free Asia" ID at 1358*. (Barbour, NH)

0149 UTC on 15585

SPAIN: Radio Exterior Espana. Contemporary Spanish music to identification. Soccer commentary 21700 at 1813. (Alvin Mirabal, Bayamon, Puerto Rico)

0155 UTC on 9975

ALBANIA: TWR. Surprised to find this one at 0155 with very strong interval signal into presumed Farsi service to 0230*. Frequency bounced down to 9974.85 twice, then carrier came back. HFCC list Cerrik transmitter site. (Jerry Berg, MA/NASWA Flash Sheet)

0210 UTC on 15515

AUSTRALIA: Radio. Pacific service of news and commentary. SINPO 35343. (Mirbal, PR). Audible on 9850 1240, interview with storm chasers and their quest during extreme weather. (Fraser, ME) 13630, 0010-0045. (Tom Banks, Dallas, TX) *Harold, were they interviewing my son Loyd?* - GVH

0237 UTC on 15495

KUWAIT: Radio. Arabic text to Koran recitations at 2243. Arabic noted 15495 at 2050 to 2100* with identification. (Mirabal, PR)

0400 UTC on 6190

CHINA: China Radio Int'l. Interval signal to identification and national news. (William McGuire, Cheverly, MD) Tentative logging for China's **Qinghai PBS** 4750, 2242-2250. (Scott Barbour, Intervale, NH) **China Business Radio** 7140, 2107-2115 // 9775. (Slaen, ARG)

0545 UTC on 15375

CHILE: Voz Cristiana. Spanish. Religious text and contemporary Christian music. Colombian address noted at 0550. SINPO 244344. (Banks, TX)

0816 UTC on 9870

MONACO: TWR. Instrumental version of *Amazing Grace* to sign-off freqs and IDs. Good signal quality for // 11865 Tirara, Albania.. (Barbour, NH)

0840 UTC on 4869.96

ECUADOR: La Voz del Upano. Spanish regional music, ID and promos. (Sam Wright, Biloxi, MS) Ecuador's **Radio Oriental** 4780.97 in Spanish at 0929. (Slaen, ARG)

0925 UTC on 3385

PAPUA NEW GUINEA: Radio East New Britain. Pidgin. Local evening events report to news program, closing with "goodbye" and regional time check. Mentions of Rabaul into island music. Commercials for printer/copiers and Coke. Station ID into island music and dance song. NBC network news 0950-1000 into ad for university event and paint shop sponsor. Nice clear signal. (Dave Valko, PA/Cumbre DX)

0928 UTC on 4765

BRAZIL: Radio Rural. Portuguese. Promos and jingles to, "...aqui, en Santarem...na Radio Rural." Brazil's **Radio Guaruja** 5930.5, 2010+ (Slaen, ARG) **Radio Cancao Nova** 9675, 2313+. (Frodge, MI) **Radio Cultura Ondas Tropicais** 4845.20, 1000-1005; **Radio Senado** 5993.57, 1014+. (Slaen, ARG)

0945 UTC on 4826.55

PERU: Radio Sicuani. Spanish/Quechua. Time check to ID. Local multilingual ads and jingles, noted on subsequent monitoring at 1020+. Peruvians audible; **Radio Horizonte** 5019.96, 1008+; **Radio Maranon** 4835.21 at 1026-1033; Radio LTC 5005.62, 1037+.

Radio Oriente 6188.01, 1040-1048; **Radio Macedonia** 4890.2, 2308-2315. (Slaen, ARG) **Radio La Voz del Campesino** 6957, 0123-0141*. (Barbour, NH)

1010 UTC on 4810

MEXICO: Radio Transcontinental. Spanish instrumentals with identifications at 1015, 1030, 1045 and 100 UTC. SINPO 24432. (Slaen, ARG)

1012 UTC on 9865

GUAM: KTWR. Closing items of Chinese service into interval signal. Station identification and English religious program. Fair signal quality. (Rich D'Angelo, PA/NASWA Flash Sheet)

1030 UTC on 6053

BOLIVIA: Radio Juan XXIII. Spanish. Educational program with interference from Radio Japan on 6055. Bolivia's **Radio Chicha** 4763.28, 1055-1110. (Slaen, ARG) **Radio Mosoj Chaski** 3310, 0135, fair - poor signal quality. (Frank Hillton, Charleston, SC)

1738 UTC on 11775

ANGUILLA: Caribbean Beacon. Dr Gene Scott explains mythology, taking time to chastise fidgety children in the audience while making a jerk of himself. (Frodge, MI) *So what else is new?* -GVH.

1826 UTC on 13855 USB

ICELAND: AFRTS. Featured segment on dedication of WWII monument. SIO 2+22 garbled at times. (Frodge, MI)

1900 UTC on 15640

ISRAEL: Kol Israel. Item on Israeli withdrawal proposes // 17535. (Fraser, ME) 15760, 2030 with romantic Hebrew music ballads in a cafe type of environment. SINPO 45534.. (Mirabal, Puerto Rico)

2004 UTC on 13610

SYRIA: Radio Damascus. Arabic/English. Arabic at tune-in with talk and music. Full English ID at 2010 and freq schedule. Fanfare effects followed by national and Arab region news items. Commentary regarding British opinion on PM Tony Blair. Poor signal quality boxed in by 13615 WEWM and 13605 AIR India until 2030*. (Barbour, NH)

2008 UTC on 17775

USA: KVOH. Via Rancho Simi, California to Central America. "La Hora de la Restauracion." Male announcer's religious text of 44454 SINPO. (Mirabal, PR)

2045 UTC on 9960

ARMENIA: Voice of. Poor signal during national news and Albanian music. Station ID, freqs and sign-off. (McGuire, MD)

2050 UTC on 9850

SAO TOME: VOA relay. Arts & Culture program to ID at 2100. SIO 3+33 with jammer interference. (Frodge, MI)

2203 UTC on 9736.86

PARAGUAY: Radio Nacional del Paraguay. Spanish sports program of football transmission from Asuncion to station jingles and promos. SINPO 44444. (Slaen, ARG)

2215 UTC on 6214.14

ARGENTINA: Radio Baluarte. Religious programming to upbeat Christian vocals. Time check to, "por Radio Baluarte...esperanza y triunfo..." (Slaen, ARG) **RAE's** Portuguese service 11710 at 0040. (Banks, TX)

2225 UTC on 9925

GERMANY: Voice of Croatia relay. Report on the Zagreb animators film festival. (Fraser, ME) Spanish service 9925, 2249-2301. Text on Mexican immigrant and workers in the USA. Identification as, "Hrvatska Radio." (Frodge, MI)

2316 UTC on 17860

RWANDA: Deutsche Welle. German. Announcer duo's discussion on terrorism by Al Qaeda. SINPO 55555. (Mirabal, Puerto Rico)

2328 UTC on 17805

USA: Radio Taiwan Intl relay. Spanish service about virtues of South American chocolate, followed by update on Mexico's upcoming 10th International DX Conference. SINPO 45534 (Mirabal, PR)

2330 UTC on 9870

AUSTRIA: Report From Austria with national current affairs. (Fraser, ME)

Thanks to our contributors - Have you sent in YOUR logs?
Send to Gayle Van Horn, c/o Monitoring Times (or e-mail
gaylevanhorn@monitoringtimes.com) **Please note:** paper strips and
cassette recordings will no longer be accepted.
English broadcast unless otherwise noted.

The Lure of QSLing Lighthouses

If you love the lure of lighthouses, here is an exceptional opportunity to answer that call. This popular annual event attracts hundreds of amateur radio stations and DX listeners from around the world.

This year's special event is from 0001 UTC Saturday August 21, until 2359 on Sunday August 22, 2004. During this time, amateur radio stations are established at lighthouses or lightships, in buildings next to the lighthouse or an adjacent field. Although this is not a contest, it is designed to promote goodwill and friendship among amateur "ham" operators, as well as shortwave hobbyists.

A complete list of lighthouses/lightships of the world can be found at <http://arlhs.com/awards/arlhs-numbers.html>. To learn how to QSL either by monitoring or working the stations (i.e....a QSL route) go to <http://illw.net/index.html>. When you report these stations, don't forget to note their call sign, frequency, time, date and whom they worked, as well as a signal report.

The Amateur Radio Lighthouse Society <http://arlhs.com/> recommends the following subbands within the five ham bands for activity during this weekend event.

CW (Morse Code)

80 meters 3.510-3.540 MHz
40 meters 7.005-7.035 MHz
20 meters 14.010-14.040 MHz
15 meters 21.010-21.040 MHz
10 meters 28.010-28.040 MHz

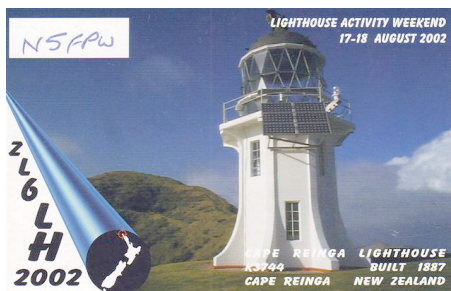
Phone (voice)

*80 meters 3.650-3.750 MHz
*40 meters 7.040-7.100 MHz
20 meters 14.125-14.275 MHz
15 meters 21.150-21.250 MHz
10 meters 28.300-28.400 MHz

* U.S. operators should replace 80 and 40 meters with 3.950-3.990 MHz and 7.250-7.290 MHz.

For additional information on this weekend consult <http://www.lighthouse.fsnet.co.uk/events/intlighthouseday.html>. (or) <http://www.waterw.com/~weidner/arlhs/index.html>.

If you love lighthouses, this a great opportunity to pay homage to those who have served as keepers of the light.



AMATEUR RADIO

Albania, ZATA, 10 meters SSB. Full data color folder card. Received in 99 days for a Euro nested envelope and two US dollars to: Martti Laine OHZBH, Savasundintie 4C, Espoo Finland 02380, Finland. (Larry Van Horn N5FPW, NC) DX CC # 171. *very pleased with this one, Albania is very tough to hear and verify on amateur radio- LVH*
New Zealand, ZL6LH Cape Reinga Lighthouse (OC-201) 20 meters SSB. Full data color lighthouse card. Received in nine days via ARRL. (Van Horn, NC)
New Zealand, ZL6QH Quartz Hill ARS (OC-201) 20 meters SSB. Full data color photo card. Received in five months via ARRL. (Van Horn, NC)

MEDIUM WAVE

Australia, Katherine, NT 639 kHz AM. Verification letter signed by Barbara Lillie Bridge-Admin. Officer, plus program schedule, and sheet on AM/FM stations Northern Territory. Received in 20 days for a taped report. Station address: ABC, GPO Box 9994, Darwin, NT 0801, 1 Cavenagh Street, Darwin NT 0800. (Patrick Marin, Seaside, OR)
Australia, 531 2PM Kempsey, NSW. Verification letter signed by Peter Rasmussen-Manager, plus stickers and map of Port Macquarie. QSL # 89 from New South Wales. Station address: Easy Listening 531 2PM, 19 Short Street, Port Macquarie NSW 2444, Australia. (Martin, OR)
Virgin Islands, WDHP 1620 kHz AM. Two full data plain paper stock QSLs signed by Audrey Browne, plus station bumper sticker. Power listed as 10 kW. First card received in seven months and one day for an AM report and mint stamps. Second QSL received in one month, 29 days for a report

of their relay programming from WRR-1290 kHz, to email wrra@islands.vi. Station address: Radio Free St. Croix, # 79A Castle Coakley, Christiansted, St. Croix, U.S. Virgin Islands 00820. (Mike Hardester, Jacksonville, NC)

KFAN, 1130 kHz AM. Partial data letter signed by Eric Aydt-Asst. Engineer, plus Clear Channel business card. Noted station is running "low power" due to recent tower collapse. Received in 16 days for an AM report. Station address: 1600 Utica Ave South 400, Minneapolis, MN 55416 (Patrick Griffith N0NNK, Westminster, CO)
KKTU, 1470 kHz AM. Very friendly full data letter signed by Dennis Switzer-Owner/Gen. Manager, plus business card. Received in 16 days for an AM report. Station address: 247 Russell Ave., Douglas, WY 82633. (Griffith, CO)

KWLO, 1330 kHz AM. Full data Confirmation of Signal Verification Report sheet, signed by Mark Schumacher-Chief Engineer and Joyce Halverson-Receptionist. Received in four years, seven months for an AM report, three mint stamps (used for reply) and an address label. Station address: 514 Jefferson St., Waterloo, IA 50701. (Bill Wilkins, Springfield, MO)

WRLL, 1690 kHz AM. Full data Real Oldies card signed by L.P.Kelly. Received in eight days for an AM report, one US dollar and an address label (used on reply). Station address: Real Oldies 1690, 233 N. Michigan Ave., Ste. 2800, Chicago, IL 60610. (Wilkins, MO)

ST. HELENA

Radio St. Helena 11092.5 kHz USB. Full data card signed by Ralph St. Peters-Station Manager, plus form letter. Received in four years, seven months for an English report

and two US dollars. (Joe Wood, Vonore, TN)
Nice to see this now defunct broadcast being verified for many DXers-GVH

UNITED ARAB EMIRATES

Abu Dhabi, AWR, 15320 kHz. Full data bible verse card signed by Adrian Peterson, plus station bookmark, calendar, magazine and sample QSLs. A difficult station to hear in Alberta, Canada. Received in nine months for an English report. Station address: Box 29235, Indianapolis, IN 46229 USA. (Joe Talbot VA6WT, Red Deer, Alberta, Canada/Cumbre DX/DXLD)

August Holiday DXing

Benin National Day, Aug. 1
Cook Islands Constitution Day, Aug. 2
Jamaica Independence Day, Aug. 2
Macedonia, St. Elijah's Day, Aug. 2
Iran Constitutional Monarchy Day, Aug. 5
Bolivia Independence Day, Aug. 6
Cote d'Ivoire Independence Day, Aug. 7
Singapore Independence Day, Aug. 9
Ecuador Quito Independence Day, Aug. 10
Liechtenstein Assumption Day, Aug. 15
South Korea Liberation Day, Aug. 15
Afghanistan Independence Day, Aug. 19
Chad Independence Day, Aug. 11
Bahrain Independence Day (from UK), Aug. 15
Congo, Rep. Independence Day, Aug. 15
Indonesia Independence Day, Aug. 17
Estonia Independence Day (from Soviet Union), Aug. 20
Hungary St. Stephen's Day, Aug. 20
Latvia Independence Day, Aug. 21
Belarus Independence Day (from Soviet Union), Aug. 25
Moldova Independence Day, Aug. 27
Kyrgyzstan Independence Day, Aug. 31
Malaysia Independence Day, Aug. 31

The Right Tool for the Job

For the last couple of months, we've been discussing the "art" of easy listening – the *aural* pursuit of pleasure, if you will, as opposed to the *competitive* pursuit of QSL cards. It just goes to show that shortwave radio offers not only a variety of things to listen to, but a variety of ways to listen, too! (Clever, eh?)

For the most part, it's possible to enjoy many if not all of these options with one single radio. However, like maybe all devices conceived and crafted by humans, certain radios are better suited to some tasks than others. It's difficult, if not prohibitively expensive, to make and sell a radio that does all things equally and very well.

◆ A Radio for the Listener

It stands to reason that a good, pleasant-to-listen-to radio would be a prerequisite for truly enjoying the programs we highlight every month in this column and *MT's Shortwave Guide*. So what does it best for the easy listener?

Excellent audio performance would appear to be a prime consideration. Many of the receivers that are very good at digging out those weaker than weak signals are hard on the ears over any length of time. Perhaps that's due to the fact that such a receiver is geared toward emphasizing that last or most accessible set of audio frequencies detectable by the human ear? On the other hand, a receiver focused on relaxed and prolonged listening would seem to need to provide a pleasing experience over a wide range of audio frequencies so as to avoid exhausting or boring those auditory senses.

In that same regard, a receiver with a minimum of background noise will be preferable. If the ear is fatigued by being bombarded with the same small set of audio frequencies, the identical effect can be created by a high level of background noise, which also covers a limited audio frequency spectrum.

All this goes pretty much for naught (although there are some workarounds we mention later) unless the receiver has a good audio section with adequate power to drive a decent wide range speaker.

Good sensitivity, selectivity and dynamic range would be important factors, too. Notice that I said "good." The radio need not be the best in these performance categories. However, average to better than average execution of these tasks will result in pleasing reception quality, with minimal interference from strong local sta-

tions and stations occupying adjacent frequencies in the crowded shortwave spectrum. A desirable capability that further enhances these reception characteristics is *selectable sideband synchronous detection*, the technical name for a feature often shortened to *sync*. It's also a good idea for such a radio to be *dual conversion* to reduce ingress from out of band signals.

◆ On the Market Now

Manufacturers of shortwave radios have been emphasizing small and low cost of late, two attributes that are not quite synonymous with superior audio quality. Whatever the reason – a waiting game for DRM (digital shortwave) or a perceived softening in the market for larger, higher quality receivers – the shortwave audiophile will be disappointed with much of the product on the market today. Furthermore, nearly every receiver today is being manufactured in China, the experience and reputation of which – while improving quickly – has been initially hampered by uneven quality control and lower build quality than had been the prevailing expectation with most radios produced elsewhere.

Nonetheless, three current receivers fit the bill to at least some extent and they range widely across the price spectrum. The best and, not surprisingly, most expensive (\$1500) is the U.S. made **Drake R8B**. This desktop model possesses all the qualities we discussed to a superior degree, including 2.5 watts of audio output power through an external speaker (not supplied). A less costly (\$500) option is the **Grundig Satellit 800**, a very large portable manufactured (as are all U.S. market Grundig-badged models) for California's Eton in China. It gives better than average to passable performance in all the noted specs with clean, clear, room-filling audio (if less than stellar bass response) from its big internal speaker.

The least expensive is the one with the most compromises. The **Grundig S350** (\$100) is a smaller, single conversion radio that falls short in a number of areas. Nonetheless, it does have very pleasing audio for its size and price and is perfectly acceptable for prolonged listening to the stronger stations – albeit with some annoying tuning drift.

◆ Homebrew Audio Improvements

A promising new, well-built Chinese receiver is the **Kaito KA1102**. It's tiny (5.6 x 3.7

x 1.25"), inexpensive (under \$100) and possesses most of the performance characteristics and features that bode well for good audio performance. What it lacks primarily is heft – specifically, enough of it to house high quality audio components and a good size speaker. A little experimentation with aftermarket products, though, may yield sufficient improvement to allow this little radio – and others, perhaps one you already have – to satisfy your ears' audio fidelity demands.

Auxiliary powered speaker systems on the market today, although developed for the computer, can work just as well for a small radio receiver. Some include subwoofers that add the bass response missing from the audio sections of today's typical small electronics products. They can be had for as little as \$20 and as much as \$200 or more and are too numerous to review helpfully here. But a little sweat equity could yield some surprising results. If you do so and find (or already have found) some solutions that work for you, let me know and I'll pass the information along here.)

Then, of course, there's the simple – and often overlooked – earphone. A good quality set of phones, ear or head, can do wonders for the audio experience with many of today's modern radios – and at a very compelling price.

◆ The "Previously Owned" Market

Finally, there are all those radios that came before and are still with us, albeit in the possession of others. More than a few provide the experience – audio and otherwise – that we're looking for. And, best of all, they remain available either in good working order or in readily repairable condition. But that discussion will have to wait for September.

Good Listening!

**GLENN HAUSER'S
WORLD OF RADIO**
<http://www.worldofradio.com>

For the latest DX and programming news, amateur nets, DX program schedules, audio archives and much more!



HOW TO USE THE SHORTWAVE GUIDE

0000-0100 twhfa USA, Voice of America 5995am 6130ca 7405am 9455af
 ① ② ⑤ ③ ④ ⑥ ⑦

Convert your time to UTC.

Broadcast time on ① and time off ② are expressed in Coordinated Universal Time (UTC) – the time at the 0 meridian near Greenwich, England. To translate your local time into UTC, first convert your local time to 24-hour format, then add (during Daylight Time) 4, 5, 6 or 7 hours for Eastern, Central, Mountain or Pacific Times, respectively. Eastern, Central, and Pacific Times are already converted to UTC for you at the top of each hour.

Note that all dates, as well as times, are in UTC; for example, a show which might air at 0030 UTC *Sunday* will be heard on *Saturday* evening in America (in other words, 8:30 pm Eastern, 7:30 pm Central, etc.).

Find the station you want to hear.

Look at the page which corresponds to the time you will be listening. On the top half of the page English broadcasts are listed by UTC time on ①, then alphabetically by country ③, followed by the station name ④. (If the station name is the same as the country, we don't repeat it, e.g., "Vanuatu, Radio" [Vanuatu].)

If a broadcast is not daily, the days of broadcast ⑤ will appear in the column following the time of broadcast, using the following codes:

Day Codes

| | |
|---------|------------------------|
| s/S | Sunday |
| m/M | Monday |
| t/T | Tuesday |
| w/W | Wednesday |
| h/H | Thursday |
| f/F | Friday |
| a/A | Saturday |
| D | Daily |
| mon/MON | monthly |
| occ: | occasional |
| DRM: | Digital Radio Mondiale |

In the same column ⑤, irregular broadcasts are indicated "tent" and programming which includes languages besides English are coded "vl" (various languages).

Choose the most promising frequencies for the time, location and conditions.

The frequencies ⑥ follow to the right of the station listing; all frequencies are listed in kilohertz (kHz). Not all listed stations will be heard from your location and virtually none of them will be heard all the time on all frequencies.

Shortwave broadcast stations change some of their frequencies at least twice a year, in April and October, to adapt to seasonal conditions.

But they can also change in response to short-term conditions, interference, equipment problems, etc. Our frequency manager coordinates published station schedules with confirmations and reports from her monitoring team and MT readers to make the Shortwave Guide up-to-date as of one week before print deadline.

To help you find the most promising signal for your location, immediately following each frequency we've included information on the target area ⑦ of the broadcast. Signals beamed toward your area will generally be easier to hear than those beamed elsewhere, even though the latter will often still be audible.

Target Areas

| | |
|------|---|
| af: | Africa |
| al: | alternate frequency (occasional use only) |
| am: | The Americas |
| as: | Asia |
| au: | Australia |
| ca: | Central America |
| do: | domestic broadcast |
| eu: | Europe |
| irr: | irregular (Costa Rica RFPI) |
| me: | Middle East |
| na: | North America |
| om: | omnidirectional |
| pa: | Pacific |
| sa: | South America |
| va: | various |

Choose a program or station you want to hear.

Selected programs for prime listening hours appear following the frequencies – space does not permit 24 hour listings nor can every station be listed. However, listings for the most popular stations and selected lesser-known stations illustrate the variety available on shortwave. The format of the listings alternates among three different styles – by station, by genre and by day – month by month. Times listed are approximate and programs are subject to change.

The program listings emphasize broadcasts targeted to North America. In most cases, the stations and programs listed should be readily receivable in North America using a portable radio. Most broadcasters produce one broadcast in English per day that is repeated over a 24 hour period to all areas. If you are able to listen to transmissions to other areas of the world during "non-prime time" hours, referring to the prime time listings for those stations will likely be helpful in determining what programs will be broadcast.

Occasionally, a program or station listing may be followed by a reference to another listing for the same program or station at a different time. This is done to conserve space and make it possible to provide more listings.

MT MONITORING TEAM

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Program Highlights

John Figliozi

SCANDIA NEWS & NOTES

Radio Sweden has announced that its program schedule will undergo significant changes in the fall. In the interim, the station is asking for help from its listeners by inviting comments about what you like and dislike about the current line-up. Send your ideas to 105 10 Stockholm or english@sr.se. Seeing as how **Radio Sweden** is the sole Scandinavian station daily on shortwave in English, you might be advised to invest a little time and thought to honor this request.

YLE Radio Finland also is (again) re-evaluating its international service, but it *doesn't* want *your* comments. You will recall that the station ended its English Service and nearly all of its foreign language component about two years ago. The idea then was that **YLE Radio Finland** should serve only the country's expatriates and Finns traveling abroad. Now it is apparently considering dropping that concept as well which presumably would mean no international service at all, at least on shortwave.

Banns Radio International could be called **Radio Denmark's** reincarnation. At least, it preserves Denmark's international broadcasting presence. Julian Isherwood, the last voice heard on Radio Denmark's English service, resurfaced quickly in 1996 with a weekly offering entitled *Copenhagen Calling*. It's an enjoyable and informative half-hour magazine summing up the previous week in Denmark, and the country's relationship with the Nordic Region and the EU. It airs on the **World Radio Network** (S 0530, 1730); and now, by virtue of **WRMI's** relay of **WRN** programming each weekend, Denmark is again on shortwave, at least as long as **WRMI** maintains this service. Frequencies are 7385 and 15725 kHz.

WRN <http://wrn.org> also netcasts and is carried on **Sirius Satellite Radio**, stream 115. For more information, as well as audio and text on demand, go to <http://euroaudio.dk>.



0000 UTC - 8PM EDT / 7PM CDT / 5PM PDT

| | | | | | |
|------|------|---|----------|----------|----------|
| 0000 | 0007 | Sierra Leone, SLBS | 3316do | | |
| 0000 | 0015 | vi Cambodia, National Radio Of | 11940as | | |
| 0000 | 0027 | Czech Rep, Radio Prague Intl | 7345na | 9440na | |
| 0000 | 0030 | Egypt, Radio Cairo | 11725na | | |
| 0000 | 0030 | Japan, Radio | 13650as | 17810as | |
| 0000 | 0030 | Serbia & Montenegro, Intl Radio | 9580na | | |
| 0000 | 0030 | Thailand, Radio | 5890va | 9570va | |
| 0000 | 0030 | UK, BBC World Service | 3915as | 5970as | |
| | | 6195as 9410as | 9740as | 11945as | 11995as |
| | | 15280as | 15360as | 17655va | 17790as |
| 0000 | 0030 | USA, Voice of America | 7215va | 15185va | |
| | | 17820va | | | |
| 0000 | 0045 | India, All India Radio | 9705as | 9950as | |
| | | 11620as 11645as | 13605as | | |
| 0000 | 0057 | Canada, Radio Canada Intl | 9640as | 15205as | |
| 0000 | 0059 | Germany, Deutsche Welle | 7130as | 9505as | |
| | | 9825as | | | |
| 0000 | 0059 | Spain, Radio Exterior Espana | 15385na | | |
| 0000 | 0100 | Anguilla, Caribbean Beacon | 6090am | | |
| 0000 | 0100 | Australia, ABC NT Alice Springs | 2310irr | 4835do | |
| 0000 | 0100 | Australia, ABC NT Katherine | 5025do | | |
| 0000 | 0100 | Australia, ABC NT Tennant Creek | 4910do | | |
| 0000 | 0100 | Australia, Radio | 9660pa | 12080va | 13630pa |
| | | 15240pa | 17750pa | 17775as | 17795as |
| | | 21725as | | | |
| 0000 | 0100 | Canada, CBC Northern Service | 9625do | | |
| 0000 | 0100 | Canada, CFRX Toronto ON | 6070do | | |
| 0000 | 0100 | Canada, CFVP Calgary AB | 6030do | | |
| 0000 | 0100 | Canada, CKZN St John's NF | 6160do | | |
| 0000 | 0100 | Canada, CKZU Vancouver BC | 6160do | | |
| 0000 | 0100 | Canada, Radio Canada Intl | 9755am | 13710am | |
| 0000 | 0100 | China, China Radio Intl | 6145va | | |
| 0000 | 0100 | Costa Rica, University Network | 5030am | 6150am | |
| | | 7375am | 9725sa | | |
| 0000 | 0100 | vi Croatia, Croatian Radio | 9925ca | | |
| 0000 | 0100 | mtwhf Germany, Bible Voice Broadcasting | | 6010na | |
| 0000 | 0100 | Guyana, Voice of | 3290do | | |
| 0000 | 0100 | Japan, Radio | 6145ca | | |
| 0000 | 0100 | Malaysia, Radio Malaysia | 7295do | | |
| 0000 | 0100 | Namibia, Namibian BC Corp | 3270af | 3290af | |
| | | 6060af | | | |
| 0000 | 0100 | Netherlands, Radio | 9845na | | |
| 0000 | 0100 | New Zealand, Radio NZ Intl | 15720pa | | |
| 0000 | 0100 | Sierra Leone, Radio UNAMSIL | 6139af | | |
| 0000 | 0100 | Singapore, Mediacorp Radio | 6150do | | |
| 0000 | 0100 | vi Solomon Islands, SIBC | 5020do | 9545do | |
| 0000 | 0100 | UK, BBC World Service | 5975ca | 7545af | |
| | | 9825ca | 11835ca | 12095ca | |
| 0000 | 0100 | Ukraine, Radio Ukraine Intl | 7545na | | |
| 0000 | 0100 | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | 12133usb | 12579usb | 13362usb | 13855usb |
| 0000 | 0100 | USA, KAIJ Dallas TX | 13815va | | |
| 0000 | 0100 | USA, KTBN Salt Lake City UT | 7505na | 15590na | |
| 0000 | 0100 | USA, KVOH Rancho Simi CA | 17775as | | |
| 0000 | 0100 | USA, KWHR Naalehu HI | 17510as | | |
| 0000 | 0100 | USA, WBCQ Kennebunk ME | 5105na | 7415na | |
| | | 9330na | | | |
| 0000 | 0100 | USA, WBOH Newport NC | 5920am | | |
| 0000 | 0100 | USA, WEWN Birmingham AL | 5825na | 7425na | |
| | | 13615va | | | |
| 0000 | 0100 | USA, WHRA Greenbush ME | 7580va | | |
| 0000 | 0100 | USA, WHRI Noblesville IN | 7315am | 7535am | |
| 0000 | 0100 | USA, WINB Red Lion PA | 9320am | | |
| 0000 | 0100 | USA, WJIE Louisville KY | 13595am | | |
| 0000 | 0100 | USA, WRMI Miami FL | 7385am | 9955am | |
| 0000 | 0100 | USA, WTJC Newport NC | 9370na | | |
| 0000 | 0100 | USA, WWCR Nashville TN | 5070na | 9475na | |
| | | 13845na | | | |
| 0000 | 0100 | USA, WWRB Manchester TN | 5050na | 5085na | |
| | | 6890na | | | |
| 0000 | 0100 | USA, WYFR Okeechobee FL | 6065na | 9505na | |
| | | 15130sa | | | |
| 0000 | 0100 | Zambia, Radio Christian Voice | 4965af | | |
| 0005 | 0030 | twhfa Austria, Radio Austria Intl | 9870sa | | |
| 0015 | 0030 | twhfa Austria, Radio Austria Intl | 9870ca | | |
| 0030 | 0100 | Australia, Radio | 9660pa | 12080va | 13630pa |
| | | 15240pa | 15415as | 17750pa | 17775as |
| | | 17795as | 21725as | | |
| 0030 | 0100 | Canada, Radio Canada Intl | 11990am | | |
| 0030 | 0100 | Iran, Voice of the Islamic Rep | 9905sa | | |
| 0030 | 0100 | Lithuania, Radio Vilnius | 11690na | | |
| 0030 | 0100 | Sri Lanka, SLBC | 6005as | 15745as | |
| 0030 | 0100 | Thailand, Radio | 5890na | | |

| | | | | |
|------|------|-----------------------------------|---------|---------|
| 0030 | 0100 | UK, BBC World Service | 6195as | 9410as |
| | | 9740as 11955as | 15280as | 15310as |
| | | 17655as | 17790as | |
| 0030 | 0100 | USA, Voice of America | 7215va | 11760va |
| | | 15185va | 15290va | 17740va |
| 0035 | 0100 | sm Austria, Radio Austria Intl | 9870ca | 17820va |
| 0045 | 0100 | twhfa Austria, Radio Austria Intl | 9870sa | |
| 0045 | 0100 | Pakistan, Radio | 9340as | 11565as |
| 0055 | 0100 | Italy, RAI Intl | 11800na | |

0100 UTC - 9PM EDT / 8PM CDT / 6PM PDT

| | | | | | |
|------|------|---|----------|----------|----------|
| 0100 | 0115 | Italy, RAI Intl | 11800na | | |
| 0100 | 0115 | Pakistan, Radio | 9340as | 11565as | |
| 0100 | 0127 | Czech Rep, Radio Prague Intl | 6200na | 7345na | |
| 0100 | 0128 | Vietnam, Voice of | 6175na | | |
| 0100 | 0130 | mtwhf Germany, Bible Voice Broadcasting | | 5925 mw | |
| 0100 | 0130 | s Germany, Universal Life | 9485as | | |
| 0100 | 0130 | mtwhfa Hungary, Radio Budapest | 9590na | | |
| 0100 | 0130 | mtwhfa Serbia & Montenegro, Intl Radio | 9580na | | |
| 0100 | 0130 | Uzbekistan, Radio Tashkent Intl | 7190as | 6165as | |
| | | 9715as | | | |
| 0100 | 0156 | Romania, Radio Romania Intl | 9690na | 11940na | |
| | | 15430na | 17760na | | |
| 0100 | 0159 | Canada, Radio Canada Intl | 9755am | 11990am | |
| | | 13710am | | | |
| 0100 | 0159 | DRM China, China Radio Intl | 6140na | | |
| 0100 | 0200 | Anguilla, Caribbean Beacon | 6090am | | |
| 0100 | 0200 | Australia, ABC NT Katherine | 5025do | | |
| 0100 | 0200 | Australia, ABC NT Tennant Creek | 4910do | | |
| 0100 | 0200 | Australia, HCJB | 15525as | 15560as | |
| 0100 | 0200 | Canada, CBC Northern Service | 9625do | | |
| 0100 | 0200 | Canada, CFRX Toronto ON | 6070do | | |
| 0100 | 0200 | Canada, CFVP Calgary AB | 6030do | | |
| 0100 | 0200 | Canada, CKZN St John's NF | 6160do | | |
| 0100 | 0200 | Canada, CKZU Vancouver BC | 6160do | | |
| 0100 | 0200 | China, China Radio Intl | 9580am | 9790ca | |
| 0100 | 0200 | Costa Rica, University Network | 5030am | 6150am | |
| | | 7375am | 9725sa | | |
| 0100 | 0200 | vi Croatia, Croatian Radio | 9925na | | |
| 0100 | 0200 | Cuba, Radio Havana | 6000na | 9820na | |
| 0100 | 0200 | Guyana, Voice of | 3290do | | |
| 0100 | 0200 | Indonesia, Voice of | 9525as | 11785as | 15150al |
| 0100 | 0200 | Iran, Voice of the Islamic Rep | 9905sa | | |
| 0100 | 0200 | Japan, Radio | 6025va | 11860as | 15325as |
| | | 17560va | 17685pa | 17810as | 17835am |
| | | 17845sa | | | |
| 0100 | 0200 | Malaysia, Radio Malaysia | 7295do | | |
| 0100 | 0200 | Namibia, Namibian BC Corp | 3270af | 3290af | |
| | | 6060af | | | |
| 0100 | 0200 | DRM Netherlands, Radio | 15525na | | |
| 0100 | 0200 | Netherlands, Radio | 9845na | | |
| 0100 | 0200 | New Zealand, Radio NZ Intl | 15720pa | | |
| 0100 | 0200 | North Korea, Voice of | 3560as | 7140as | |
| | | 9345am | 9720as | 11735am | 13760as |
| | | 15180as | | | |
| 0100 | 0200 | Russia, Voice of | 5945me | 9665na | 15595na |
| | | 17660na | | | |
| 0100 | 0200 | Sierra Leone, Radio UNAMSIL | 6139af | | |
| 0100 | 0200 | Singapore, Mediacorp Radio | 6150do | | |
| 0100 | 0200 | vi Solomon Islands, SIBC | 5020do | 9545do | |
| 0100 | 0200 | Sri Lanka, SLBC | 6005as | 11905as | 15745as |
| 0100 | 0200 | UK, BBC World Service | 5975ca | 6195as | |
| | | 9410as 9525ca | 9825ca | 11835ca | 12095ca |
| | | 15280as | 15310as | 15360as | 17790as |
| 0100 | 0200 | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | 12133usb | 12579usb | 13362usb | 13855usb |
| 0100 | 0200 | USA, KAIJ Dallas TX | 13815va | | |
| 0100 | 0200 | USA, KJES Vado NM | 7555na | | |
| 0100 | 0200 | USA, KTBN Salt Lake City UT | 7505na | | |
| 0100 | 0200 | USA, KVOH Rancho Simi CA | 9975as | | |
| 0100 | 0200 | USA, KWHR Naalehu HI | 17510as | | |
| 0100 | 0200 | mtwhf USA, Voice of America | 7115va | 9885va | |
| | | 11705va | 11725va | | |
| 0100 | 0200 | USA, WBCQ Kennebunk ME | 5105na | 7415na | |
| | | 9330na | | | |
| 0100 | 0200 | USA, WBOH Newport NC | 5920am | | |
| 0100 | 0200 | USA, WEWN Birmingham AL | 5825na | 7425na | |
| | | 13615va | | | |
| 0100 | 0200 | USA, WHRA Greenbush ME | 7580va | | |
| 0100 | 0200 | USA, WHRI Noblesville IN | 7315am | 7535am | |
| 0100 | 0200 | USA, WINB Red Lion PA | 9320am | | |
| 0100 | 0200 | USA, WJIE Louisville KY | 13595am | | |
| 0100 | 0200 | USA, WRMI Miami FL | 7385am | 9955am | |
| 0100 | 0200 | USA, WTJC Newport NC | 9370na | | |

SELECTED PROGRAMMING BEGINS ON PAGE 57

Shortwave Guide



| | | | | | |
|------|------|-------|-------------------------------|---------|---------|
| 0100 | 0200 | | USA, WWCN Nashville TN | 3210na | 5070na |
| | | | 7465na 13845na | | |
| 0100 | 0200 | | USA, WWRB Manchester TN | 5050na | 5085na |
| | | | 6890na | | |
| 0100 | 0200 | | USA, WYFR Okeechobee FL | 6065na | 9505na |
| | | | 15060va | | |
| 0100 | 0200 | | Zambia, Radio Christian Voice | 4965af | |
| 0105 | 0130 | sm | Austria, Radio Austria Intl | 9870na | |
| 0115 | 0120 | | Kyrgyzstan, Radio Kyrgyz | 4010irr | 4795irr |
| 0115 | 0130 | mtwhf | Austria, Radio Austria Intl | 9870am | |
| 0130 | 0145 | twhfa | Germany, Pan American BC | 9495eu | |
| 0130 | 0200 | | Australia, Radio 9660pa | 12080va | 13630pa |
| | | | 15240pa 15415as | 17750as | 17775as |
| | | | 17795as 21725as | | |
| 0130 | 0200 | | Sweden, Radio 6010na | 9435va | |
| 0130 | 0200 | | USA, Voice of America | 9775am | 13740am |
| 0135 | 0150 | sm | Austria, Radio Austria Intl | 9870am | |
| 0140 | 0200 | | Vatican City, Vatican Radio | 9650as | 12055as |
| 0145 | 0200 | | Albania, Radio Tirana Intl | 6115eu | 7160eu |
| 0145 | 0200 | | Austria, Radio Austria Intl | 9870am | |

0200 UTC - 10PM EDT / 9PM CDT / 7PM PDT

| | | | | | |
|------|--------|-------|---------------------------------|----------|----------|
| 0200 | 0230 | | Australia, HCJB | 15525as | 15560as |
| 0200 | 0230 | | Austria, AWR Europe | 9820as | |
| 0200 | 0230 | fmw | Belarus, Radio Belarus Intl | 9650eu | 12055eu |
| 0200 | 0230 | vl | Croatia, Croatian Radio | 9925na | |
| 0200 | 0230 | | Iran, Voice of the Islamic Rep | 9905sa | |
| 0200 | 0230 | a | UK, Wales Radio Intl | 9795na | |
| 0200 | 0230 | | USA, KJES Vado NM | 7555na | |
| 0200 | 0257 | | Canada, Radio Canada Intl | 15510as | 17860as |
| 0200 | 0300 | | Anguilla, Caribbean Beacon | 6090am | |
| 0200 | 0300 | twhfa | Argentina, RAE | 11710na | |
| 0200 | 0300 | | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0200 | 0300 | | Australia, ABC NT Katherine | 5025do | |
| 0200 | 0300 | | Australia, ABC NT Tennant Creek | 4910do | |
| 0200 | 0300 | | Australia, Radio 9660pa | 12080va | 13630pa |
| | | | 15240pa 15415as | 17750as | 17750as |
| | | | 21725as | | |
| 0200 | 0300 | | Bulgaria, Radio 9700na | 11700na | |
| 0200 | 0300 | | Canada, CBC Northern Service | 9625do | |
| 0200 | 0300 | | Canada, CFRX Toronto ON | 6070do | |
| 0200 | 0300 | | Canada, CFVP Calgary AB | 6030do | |
| 0200 | 0300 | | Canada, CKZN St John's NF | 6160do | |
| 0200 | 0300 | | Canada, CKZU Vancouver BC | 6160do | |
| 0200 | 0300 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | | |
| 0200 | 0300 | | Cuba, Radio Havana | 6000na | 9820na |
| 0200 | 0300 | | Egypt, Radio Cairo | 11855na | |
| 0200 | 0300 | | Guyana, Voice of | 3290do | |
| 0200 | 0300 | | Malaysia, Radio Malaysia | 7295do | |
| 0200 | 0300 | | Myanmar, Radio | 7185do | |
| 0200 | 0300 | | Namibia, Namibian BC Corp | 3270af | 3290af |
| | | | 6090af | | |
| 0200 | 0300 | | New Zealand, Radio NZ Intl | 15720pa | |
| 0200 | 0300 | | North Korea, Voice of | 4405as | 11845as |
| | | | 15230as | | |
| 0200 | 0300as | | Philippines, Radio Pilipinas | 11885me | 15120me |
| 0200 | 0300 | | Russia, Voice of | 5945me | 15270me |
| | | | 15595na 17660na | 9665na | 9860na |
| 0200 | 0300 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0200 | 0300 | | Singapore, Mediagroup Radio | 6150do | |
| 0200 | 0300 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0200 | 0300 | | South Korea, Radio Korea Intl | 9560na | 11810na |
| | | | 15575na | | |
| 0200 | 0300 | | Sri Lanka, SLBC | 6005as | 11905as |
| 0200 | 0300 | | Taiwan, Radio Taiwan Intl | 5950na | 15745as |
| | | | 11875as 15320as | 15465as | 9680na |
| 0200 | 0300 | | UK, BBC World Service | 5975ca | 6195me |
| | | | 9410va 9750af | 9825ca | 11760me |
| | | | 11835ca 11955as | 12095ca | 15280as |
| | | | 15310as 15360as | 17790as | |
| 0200 | 0300 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb 6350usb | 7507usb | 10320usb |
| | | | 12133usb 12579usb | 13362usb | 13855usb |
| 0200 | 0300 | | USA, KALJ Dallas TX | 5755va | |
| 0200 | 0300 | | USA, KTNB Salt Lake City UT | 7505na | |
| 0200 | 0300 | | USA, KVOH Rancho Simi CA | 9975as | |
| 0200 | 0300 | | USA, KWHR Naalehu HI | 17510as | |
| 0200 | 0300 | mtwhf | USA, Voice of America | 7115va | 9885va |
| | | | 11705va 11725va | | |
| 0200 | 0300 | | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| | | | 9330na | | |
| 0200 | 0300 | | USA, WBOH Newport NC | 5920am | |
| 0200 | 0300 | | USA, WEWN Birmingham AL | 5825na | 7425na |
| | | | 13615va | | |
| 0200 | 0300 | | USA, WHRA Greenbush ME | 7580va | |
| 0200 | 0300 | | USA, WHRI Noblesville IN | 7315am | 7535am |
| 0200 | 0300 | | USA, WINB Red Lion PA | 9320am | |
| 0200 | 0300 | | USA, WJIE Louisville KY | 13595am | |

| | | | | | |
|------|------|--------|-------------------------------|---------|--------|
| 0200 | 0300 | | USA, WRMI Miami FL | 7385am | 9955am |
| 0200 | 0300 | | USA, WTJC Newport NC | 9370na | |
| 0200 | 0300 | | USA, WWCN Nashville TN | 3210na | 5070na |
| | | | 5770na 5935na | | |
| 0200 | 0300 | | USA, WWRB Manchester TN | 5050na | 5085na |
| | | | 6890na | | |
| 0200 | 0300 | | USA, WYFR Okeechobee FL | 5985na | 6065na |
| | | | 9505na 11855ca | 15255ca | |
| 0200 | 0300 | | Zambia, Radio Christian Voice | 4965af | |
| 0215 | 0230 | | Nepal, Radio | 3230as | 5005as |
| | | | 7165as | | |
| 0230 | 0258 | | Vietnam, Voice of | 6175na | |
| 0230 | 0300 | | Albania, Radio Tirana Intl | 6115eu | 7160eu |
| 0230 | 0300 | mtwhfa | Hungary, Radio Budapest | 9790na | |
| 0230 | 0300 | | Sweden, Radio | 6010na | |
| 0250 | 0300 | | Vatican City, Vatican Radio | 7305am | 9605am |
| 0250 | 0300 | | Zambia, Radio | 4910do | |

0300 UTC - 11PM EDT / 10PM CDT / 8PM PDT

| | | | | | |
|------|------|-------|---------------------------------|----------|----------|
| 0300 | 0315 | | Vatican City, Vatican Radio | 17590va | |
| 0300 | 0327 | | Czech Rep, Radio Prague Intl | 7345na | 9870na |
| 0300 | 0330 | | Egypt, Radio Cairo | 11855na | |
| 0300 | 0330 | as | Philippines, Radio Pilipinas | 11885me | 15120me |
| | | | 15270me | | |
| 0300 | 0330 | | Thailand, Radio | 15395na | |
| 0300 | 0330 | | Vatican City, Vatican Radio | 9660af | |
| 0300 | 0350 | | Turkey, Voice of | 6020va | 7270me |
| 0300 | 0355 | | South Africa, Channel Africa | 3345af | 6160af |
| | | | 9770af | | |
| 0300 | 0400 | | Anguilla, Caribbean Beacon | 6090am | |
| 0300 | 0400 | | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0300 | 0400 | | Australia, ABC NT Katherine | 5025do | |
| 0300 | 0400 | | Australia, ABC NT Tennant Creek | 4910do | |
| 0300 | 0400 | | Australia, Radio 9660pa | 12080va | 13630pa |
| | | | 15240pa 15415as | 17750as | 17750as |
| | | | 21725as | | |
| 0300 | 0400 | | Canada, CBC Northern Service | 9625do | |
| 0300 | 0400 | | Canada, CFRX Toronto ON | 6070do | |
| 0300 | 0400 | | Canada, CFVP Calgary AB | 6030do | |
| 0300 | 0400 | | Canada, CKZN St John's NF | 6160do | |
| 0300 | 0400 | | Canada, CKZU Vancouver BC | 6160do | |
| 0300 | 0400 | | China, China Radio Intl | 9690am | 9790ca |
| 0300 | 0400 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am 9725sa | | |
| 0300 | 0400 | | Cuba, Radio Havana | 6000na | 9820na |
| 0300 | 0400 | | Germany, Overcomer Ministries | 9490eu | 9850me |
| | | | 11645pa 13635af | 13770me | 13810as |
| | | | 15695eu 15715as | | |
| 0300 | 0400 | vl | Guatemala, Radio Cultural | 3300am | |
| 0300 | 0400 | | Guyana, Voice of | 3290do | |
| 0300 | 0400 | | Japan, Radio | 21610pa | |
| 0300 | 0400 | | Malaysia, Radio Malaysia | 7295do | |
| 0300 | 0400 | | Malaysia, Voice of | 6175as | 15295as |
| 0300 | 0400 | | Namibia, Namibian BC Corp | 3270af | 3290af |
| | | | 6090af | | |
| 0300 | 0400 | | New Zealand, Radio NZ Intl | 15720pa | |
| 0300 | 0400 | | North Korea, Voice of | 3560as | 7140as |
| | | | 9345as 9720as | | |
| 0300 | 0400 | | Oman, Radio | 15355af | |
| 0300 | 0400 | | Russia, Voice of | 7300na | 9665na |
| | | | 15595na 17660na | 9860na | |
| 0300 | 0400 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0300 | 0400 | | Singapore, Mediagroup Radio | 6150do | |
| 0300 | 0400 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0300 | 0400 | | Sri Lanka, SLBC | 6005as | 11905as |
| 0300 | 0400 | | Taiwan, Radio Taiwan Intl | 5950na | 15215na |
| | | | 15320as | | |
| 0300 | 0400 | | Uganda, Radio | 4976do | 5026do |
| 0300 | 0400 | | UK, BBC World Service | 5975ca | 6195eu |
| | | | 9410va 11760me | 11835ca | 12095va |
| | | | 15280 as 15310as | 15360as | 15575me |
| | | | 17760as 17790as | 21660as | |
| 0300 | 0400 | | Ukraine, Radio Ukraine Intl | 7545na | |
| 0300 | 0400 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb 6350usb | 7507usb | 10320usb |
| | | | 12133usb 12579usb | 13362usb | 13855usb |
| 0300 | 0400 | | USA, KALJ Dallas TX | 5755va | |
| 0300 | 0400 | | USA, KTNB Salt Lake City UT | 7505na | |
| 0300 | 0400 | | USA, KVOH Rancho Simi CA | 9975as | |
| 0300 | 0400 | | USA, KWHR Naalehu HI | 17510as | |
| 0300 | 0400 | mtwhf | USA, Voice of America | 6080af | 7105af |
| | | | 7290af 7340af | 9885af | 12080af |
| | | | | | 17895af |
| 0300 | 0400 | | USA, Voice of America | 9620va | 11695va |
| 0300 | 0400 | | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| | | | 9330na | | |
| 0300 | 0400 | | USA, WBOH Newport NC | 5920am | |
| 0300 | 0400 | | USA, WEWN Birmingham AL | 5825na | 7425na |
| | | | 13615va | | |
| 0300 | 0400 | | USA, WHRA Greenbush ME | 7580va | |

Shortwave Guide



| | | | | |
|------|------|-------------------------------|---------|-----------------|
| 0300 | 0400 | USA, WHRI Noblesville IN | 7315am | 7535am |
| 0300 | 0400 | USA, WINB Red Lion PA | 9320am | |
| 0300 | 0400 | USA, WJIE Louisville KY | 13595am | |
| 0300 | 0400 | USA, WMLK Bethel PA | 9465eu | 9955al |
| 0300 | 0400 | USA, WRMI Miami FL | 7385am | 9955am |
| 0300 | 0400 | USA, WTJC Newport NC | 9370na | |
| 0300 | 0400 | USA, WWCN Nashville TN | 3210na | 5070na |
| | | 5770na | 5935na | |
| 0300 | 0400 | USA, WWRB Manchester TN | 5050na | 5085na |
| | | 6890na | | |
| 0300 | 0400 | USA, WYFR Okeechobee FL | 6065na | 9505va |
| | | 11740na | | |
| 0300 | 0400 | Zambia, Radio | 4910do | |
| 0300 | 0400 | Zambia, Radio Christian Voice | 4965af | |
| 0300 | 0400 | Zimbabwe, ZBC Corp | 5975do | |
| 0330 | 0357 | Czech Rep, Radio Prague Intl | 11600va | 15600va |
| 0330 | 0358 | Vietnam, Voice of | 6175ca | |
| 0330 | 0400 | UAE, Radio Dubai | 12005na | |
| 0330 | 0400 | UK, BBC World Service | 3255af | 6005af |
| | | 6190af 7120af | 7160af | 12035af 15420af |
| 0330 | 0400 | USA, Voice of America | 6080af | 7105af |
| | | 7290af 9885af | 12080af | 17895af |
| 0345 | 0400 | Tajikistan, Radio | 7245irr | |

0400 UTC - 12AM EDT / 11PM CDT / 9PM PDT

| | | | | | |
|------|------|---------------------------------|----------|----------|----------|
| 0400 | 0415 | Israel, Kol Israel | 9435va | 11590va | 17600va |
| 0400 | 0430 | Belgium, Radio Vlaanderen Intl | 11635na | | |
| 0400 | 0430 | Croatia, Croatian Radio | 9480na | 12105va | |
| | | 12110va | | | |
| 0400 | 0430 | France, Radio France Intl | 9550af | 9805af | |
| | | 11955af | 13610af | | |
| 0400 | 0430 | Sri Lanka, SLBC | 6005as | 11905as | 15745as |
| 0400 | 0430 | USA, Voice of America | 4960af | 6080af | |
| | | 7290af 9575af | 9885af | 12080af | 17895af |
| 0400 | 0456 | Romania, Radio Romania Intl | 11820na | 15140na | |
| | | 15235na | 17860na | | |
| 0400 | 0458 | New Zealand, Radio NZ Intl | 15720pa | | |
| 0400 | 0459 | Germany, Deutsche Welle | 7225af | 9630af | |
| | | 9710af 11945af | | | |
| 0400 | 0500 | Anguilla, Caribbean Beacon | 6090am | | |
| 0400 | 0500 | Australia, ABC NT Alice Springs | 2310irr | 4835do | |
| 0400 | 0500 | Australia, ABC NT Katherine | 5025do | | |
| 0400 | 0500 | Australia, ABC NT Tennant Creek | 4910do | | |
| 0400 | 0500 | Australia, Radio | 9660pa | 12080va | 13630pa |
| | | 15240pa | 15515va | 17750as | 21725as |
| 0400 | 0500 | Canada, CBC Northern Service | 9625do | | |
| 0400 | 0500 | Canada, CFRX Toronto ON | 6070do | | |
| 0400 | 0500 | Canada, CKZN St John's NF | 6160do | | |
| 0400 | 0500 | Canada, CKZU Vancouver BC | 6160do | | |
| 0400 | 0500 | China, China Radio Intl | 6190am | 9560am | |
| | | 9755am | 17490am | 17650am | |
| 0400 | 0500 | Costa Rica, University Network | 5030am | 6150am | |
| | | 7375am | 9725sa | | |
| 0400 | 0500 | Cuba, Radio Havana | 6000na | 9820na | |
| 0400 | 0500 | Guyana, Voice of | 3290do | | |
| 0400 | 0500 | Malaysia, Radio Malaysia | 7295do | | |
| 0400 | 0500 | Malaysia, Voice of | 9750as | 15295as | |
| 0400 | 0500 | Namibia, Namibian BC Corp | 3270af | 3290af | |
| | | 6090af | | | |
| 0400 | 0500 | Netherlands, Radio | 6165na | 9590na | |
| 0400 | 0500 | Netherlands, Radio | 15400au | | |
| 0400 | 0500 | Russia, Voice of | 7300na | 9665na | 15595na |
| | | 17660na | | | |
| 0400 | 0500 | Sierra Leone, Radio UNAMSIL | 6139af | | |
| 0400 | 0500 | Singapore, Mediacorp Radio | 6150do | | |
| 0400 | 0500 | Solomon Islands, SIBC | 5020do | 9545do | |
| 0400 | 0500 | Uganda, Radio | 4976do | 5026do | 7196do |
| 0400 | 0500 | UK, BBC World Service | 3255af | 5975ca | |
| | | 6005af 6190af | 6195eu | 7120af | 7160af |
| | | 9410va | 11760me | 11835ca | 12035af |
| | | 12095va | 15280as | 15310as | 15360as |
| | | 15420af | 15575me | 17760as | 17790as |
| | | 21660as | | | |
| 0400 | 0500 | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | 12133usb | 12579usb | 13362usb | 13855usb |
| 0400 | 0500 | USA, KAIJ Dallas TX | 5755va | | |
| 0400 | 0500 | USA, KTBN Salt Lake City UT | 7505na | | |
| 0400 | 0500 | USA, KVOH Rancho Simi CA | 9975as | | |
| 0400 | 0500 | USA, KWHR Naalehu HI | 17780as | | |
| 0400 | 0500 | USA, Voice of America | 9620va | 11695va | |
| 0400 | 0500 | USA, WBCQ Kennebunk ME | 5105na | 7415na | |
| | | 9330na | | | |
| 0400 | 0500 | USA, WBOH Newport NC | 5920am | | |
| 0400 | 0500 | USA, WEWN Birmingham AL | 5825na | 7425na | |
| | | 13615va | | | |
| 0400 | 0500 | USA, WHRA Greenbush ME | 7580va | | |
| 0400 | 0500 | USA, WHRI Noblesville IN | 7315am | 7535am | |
| 0400 | 0500 | USA, WJIE Louisville KY | 7490am | 13595am | |

| | | | | |
|------|------|---------------------------------|---------|-----------------|
| 0400 | 0500 | USA, WRMI Miami FL | 7385am | 9955am |
| 0400 | 0500 | USA, WTJC Newport NC | 9370na | |
| 0400 | 0500 | USA, WWCN Nashville TN | 3210na | 5070na |
| | | 5770na | 5935na | |
| 0400 | 0500 | USA, WWRB Manchester TN | 5050na | 5085na |
| | | 6890na | | |
| 0400 | 0500 | USA, WYFR Okeechobee FL | 6855va | 7355va |
| | | 9715na | | |
| 0400 | 0500 | Zambia, Radio | 4910do | |
| 0400 | 0500 | Zambia, Radio Christian Voice | 4965af | |
| 0400 | 0500 | Zimbabwe, ZBC Corp | 5975do | |
| 0415 | 0420 | vt | | |
| 0430 | 0500 | mtwhf | | |
| 0430 | 0500 | Kyrgyzstan, Radio Kyrgyz | 4010irr | 4795irr |
| 0430 | 0500 | Nigeria, Radio/Enugu | 6025do | |
| 0430 | 0500 | Nigeria, Radio/Ibadan | 6050do | |
| 0430 | 0500 | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 0430 | 0500 | Nigeria, Radio/Lagos | 3326do | 4990do |
| 0430 | 0500 | Serbia & Montenegro, Intl Radio | 9580va | |
| 0430 | 0500 | Swaziland, TWR | 4775af | 6120af |
| 0430 | 0500 | USA, Voice of America | 4960af | 6080af |
| | | 7290af 9575af | 11835af | 12080af 17895af |
| 0445 | 0500 | Italy, RAI Intl | 6110af | 7235af 9875af |
| 0459 | 0500 | New Zealand, Radio NZ Intl | 9615pa | |

0500 UTC - 1AM EDT / 12AM CDT / 10PM PDT

| | | | | |
|------|------|---------------------------------|----------|-------------------|
| 0500 | 0530 | France, Radio France Intl | 11850af | 13610af |
| | | 15155af | | |
| 0500 | 0530 | UK, BBC World Service | 6005af | 6190af |
| | | 7160af 11765af | 11940af | 11955as 15280as |
| | | 15310as | 15360as | 15420af 17640af |
| | | 17760me | 17790as | 17885af 21660as |
| 0500 | 0530 | Vatican City, Vatican Radio | 9660af | 11625af |
| | | 13765af | | |
| 0500 | 0559 | Germany, Deutsche Welle | 9630af | 9700af |
| | | 12045af | 15410af | 17860af |
| 0500 | 0600 | Anguilla, Caribbean Beacon | 6090am | |
| 0500 | 0600 | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0500 | 0600 | Australia, ABC NT Katherine | 5025do | |
| 0500 | 0600 | Australia, ABC NT Tennant Creek | 4910do | |
| 0500 | 0600 | Australia, Radio | 9660pa | 12080va 13630pa |
| | | 15160pa | 15240as | 15415va |
| | | 17750as | 21725as | |
| 0500 | 0600 | Canada, CBC Northern Service | 9625do | |
| 0500 | 0600 | Canada, CFRX Toronto ON | 6070do | |
| 0500 | 0600 | Canada, CKZN St John's NF | 6160do | |
| 0500 | 0600 | Canada, CKZU Vancouver BC | 6160do | |
| 0500 | 0600 | China, China Radio Intl | 9560am | 9755na |
| | | 17490am | 17650am | |
| 0500 | 0600 | Costa Rica, University Network | 5030am | 6150am |
| | | 7375am | 9725sa | |
| 0500 | 0600 | Cuba, Radio Havana | 9550ca | 9655pa |
| | | 9820pa | | |
| 0500 | 0600 | Guyana, Voice of | 3290do | |
| 0500 | 0600 | Japan, Radio | 5975va | 6110na 7230va |
| | | 15195va | 17810va | 21755va |
| 0500 | 0600 | Malaysia, Radio Malaysia | 7295do | |
| 0500 | 0600 | Malaysia, Voice of | 9750as | 15295as |
| 0500 | 0600 | Namibia, Namibian BC Corp | 6060af | 6175al |
| 0500 | 0600 | New Zealand, Radio NZ Intl | 9615pa | |
| 0500 | 0600 | Nigeria, Radio/Enugu | 6025do | |
| 0500 | 0600 | Nigeria, Radio/Ibadan | 6050do | |
| 0500 | 0600 | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 0500 | 0600 | Nigeria, Radio/Lagos | 3326do | 4990do |
| 0500 | 0600 | Nigeria, Voice of | 7255af | 15120af |
| 0500 | 0600 | Russia, Voice of | 21790pa | |
| 0500 | 0600 | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0500 | 0600 | Singapore, Mediacorp Radio | 6150do | |
| 0500 | 0600 | Solomon Islands, SIBC | 5020do | 9545do |
| 0500 | 0600 | South Africa, Channel Africa | 7210af | 9770af |
| 0500 | 0600 | Swaziland, TWR | 6120af | 7205af 9500af |
| 0500 | 0600 | Uganda, Radio | 4976do | 5026do 7196do |
| 0500 | 0600 | UK, BBC World Service | 9410me | 11760me |
| | | 15565me | 15575me | |
| 0500 | 0600 | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | 5765usb | 6350usb | 7507usb 10320usb |
| | | 12133usb | 12579usb | 13362usb 13855usb |
| 0500 | 0600 | USA, KAIJ Dallas TX | 5755va | |
| 0500 | 0600 | USA, KTBN Salt Lake City UT | 7505na | |
| 0500 | 0600 | USA, KVOH Rancho Simi CA | 9975as | |
| 0500 | 0600 | USA, KWHR Naalehu HI | 11565as | 17780as |
| 0500 | 0600 | USA, Voice of America | 6035af | 6080af |
| | | 6180af 7290af | 12080af | |
| 0500 | 0600 | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| 0500 | 0600 | USA, WBOH Newport NC | 5920am | |
| 0500 | 0600 | USA, WEWN Birmingham AL | 5825na | 7425na |
| | | 13615va | | |
| 0500 | 0600 | USA, WHRA Greenbush ME | 11730na | |
| 0500 | 0600 | USA, WHRI Noblesville IN | 7315am | 7535am |
| 0500 | 0600 | USA, WJIE Louisville KY | 7490am | 13595am |
| 0500 | 0600 | USA, WMLK Bethel PA | 9465eu | 9955al |

Shortwave Guide



| | | | | | |
|------|------|----|---------------------------------|---------|---------|
| 0500 | 0600 | | USA, WRMI Miami FL | 7385am | 9955am |
| 0500 | 0600 | | USA, WTJC Newport NC | 9370na | |
| 0500 | 0600 | | USA, WWCR Nashville TN | 3210na | 5070na |
| | | | 5770na | 5935na | |
| 0500 | 0600 | | USA, WYFR Okeechobee FL | 6855va | 9355eu |
| 0500 | 0600 | | Zambia, Radio Christian Voice | 9865af | |
| 0500 | 0600 | vl | Zimbabwe, ZBC Corp | 5975do | |
| 0505 | 0530 | s | Austria, Radio Austria Intl | 17870me | |
| 0515 | 0525 | | Rwanda, Radio | 6005do | |
| 0525 | 0600 | vl | Ghana, Ghana BC Corp | 3366do | 4915do |
| 0530 | 0600 | | Georgia, Radio Georgia | 11805eu | |
| 0530 | 0600 | | Serbia & Montenegro, Intl Radio | 9580va | |
| 0530 | 0600 | | Thailand, Radio | 21795eu | |
| 0530 | 0600 | | UAE, Radio Dubai | 15435va | 21700va |
| 0530 | 0600 | | UK, BBC World Service | 6005af | 6190af |
| | | | 7160af 11765af | 11940af | 11955as |
| | | | 15360as | 15420af | 17640af |
| | | | 17790as | 21660as | 17760as |
| 0535 | 0600 | s | Austria, Radio Austria Intl | 17870me | |

0600 UTC - 2AM EDT / 1AM CDT / 11PM PDT

| | | | | | |
|------|------|-------|---------------------------------|----------|----------|
| 0600 | 0603 | vl | Croatia, Croatian Radio | 9480na | 12105va |
| | | | 12110va | | |
| 0600 | 0620 | | Vatican City, Vatican Radio | 4005eu | 5890eu |
| | | | 7250eu | | |
| 0600 | 0630 | | France, Radio France Intl | 11665as | 11725as |
| | | | 15155as | 17800as | |
| 0600 | 0630 | | Swaziland, TWR | 6120af | 7205af |
| 0600 | 0630 | mtwhf | USA, Voice of America | 6035af | 6180af |
| | | | 12080af | | |
| 0600 | 0659 | | Germany, Deutsche Welle | 7170af | 15275af |
| | | | 17860af | 21675af | |
| 0600 | 0700 | | Anguilla, Caribbean Beacon | 6090am | |
| 0600 | 0700 | | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0600 | 0700 | | Australia, ABC NT Katherine | 5025do | |
| 0600 | 0700 | | Australia, ABC NT Tennant Creek | 4910do | |
| 0600 | 0700 | | Australia, Radio | 9660pa | 12080va |
| | | | 13605pa | 13630pa | 15160pa |
| | | | 15415va | 15515va | 17750as |
| 0600 | 0700 | | Canada, CFRX Toronto ON | 6070do | |
| 0600 | 0700 | | Canada, CFVP Calgary AB | 6030do | |
| 0600 | 0700 | | Canada, CKZN St John's NF | 6160do | |
| 0600 | 0700 | | Canada, CKZU Vancouver BC | 6160do | |
| 0600 | 0700 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am | 9725sa | 11870sa |
| 0600 | 0700 | | Cuba, Radio Havana | 9550ca | 9655pa |
| | | | 9820pa | | |
| 0600 | 0700 | | Germany, Deutsche Welle | 6140eu | |
| 0600 | 0700 | vl | Ghana, Ghana BC Corp | 3366do | 4915do |
| 0600 | 0700 | | Guyana, Voice of | 3290do | |
| 0600 | 0700 | | Japan, Radio | 7230va | 11715va |
| | | | 11690va | 11760va | 13630va |
| | | | 17870va | 21755va | 15195va |
| | | | Liberia, ELWA | 4760do | |
| 0600 | 0700 | | Malaysia, Radio Malaysia | 7295do | |
| 0600 | 0700 | | Malaysia, Voice of | 6175as | |
| 0600 | 0700 | | Namibia, Namibian BC Corp | 6060af | 6175al |
| 0600 | 0700 | | New Zealand, Radio NZ Intl | 9615pa | |
| 0600 | 0700 | | Nigeria, Radio/Enugu | 6025do | |
| 0600 | 0700 | | Nigeria, Radio/Ibadan | 6050do | |
| 0600 | 0700 | | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 0600 | 0700 | | Nigeria, Radio/Lagos | 3326do | 4990do |
| 0600 | 0700 | | Nigeria, Voice of | 7255af | 15120af |
| 0600 | 0700 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 0600 | 0700 | | Russia, Voice of | 21790pa | |
| 0600 | 0700 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0600 | 0700 | | Singapore, Mediacorp Radio | 6150do | |
| 0600 | 0700 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0600 | 0700 | | South Africa, Channel Africa | 7210af | 15215af |
| 0600 | 0700 | | UK, BBC World Service | 6005af | 6190af |
| | | | 7160af 9410eu | 11760af | 12095eu |
| | | | 15485eu | 15545af | 15565me |
| | | | 17640af | | 15575me |
| 0600 | 0700 | as | UK, BBC World Service | 17885af | |
| 0600 | 0700 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb | 6350usb | 7507usb |
| | | | 12133usb | 12579usb | 13362usb |
| 0600 | 0700 | | USA, KALJ Dallas TX | 5755va | |
| 0600 | 0700 | | USA, KTBN Salt Lake City UT | 7505na | |
| 0600 | 0700 | | USA, KVOH Rancho Simi CA | 9975as | |
| 0600 | 0700 | | USA, KWHR Naalehu HI | 11565as | 17780as |
| 0600 | 0700 | | USA, Voice of America | 6080af | 7290af |
| 0600 | 0700 | | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| 0600 | 0700 | | USA, WBOH Newport NC | 5920am | |
| 0600 | 0700 | | USA, WEWN Birmingham AL | 5825na | 7425na |
| | | | 7580va | 13615na | |
| 0600 | 0700 | | USA, WHRA Greenbush ME | 11730na | |
| 0600 | 0700 | | USA, WHRI Noblesville IN | 7315am | 7535am |

| | | | | | |
|------|------|----|-------------------------------|---------|---------|
| 0600 | 0700 | | USA, WJIE Louisville KY | 7490am | 13595am |
| 0600 | 0700 | | USA, WMLK Bethel PA | 9465eu | 9955al |
| 0600 | 0700 | | USA, WRMI Miami FL | 7385am | 9955am |
| 0600 | 0700 | | USA, WTJC Newport NC | 9370na | |
| 0600 | 0700 | | USA, WWCR Nashville TN | 3210na | 5070na |
| | | | 5770na | 5935na | |
| 0600 | 0700 | | USA, WYFR Okeechobee FL | 7355eu | 11530eu |
| | | | 11580eu | | |
| 0600 | 0700 | vl | Vanuatu, Radio | 4960do | 7260do |
| 0600 | 0700 | | Yemen, Rep of Yemen Radio | 9780me | |
| 0600 | 0700 | | Zambia, Radio Christian Voice | 9865af | |
| 0600 | 0700 | vl | Zimbabwe, ZBC Corp | 5975do | |
| 0630 | 0645 | | Vatican City, Vatican Radio | 5890va | 15595va |
| 0630 | 0700 | | Bulgaria, Radio | 11600eu | 13600eu |
| 0630 | 0700 | | Swaziland, TWR | 7205af | 9500af |
| 0630 | 0700 | | Vatican City, Vatican Radio | 11625af | 13765af |
| | | | 15570af | | |
| 0645 | 0700 | as | Albania, TWR | 11865eu | |
| 0645 | 0700 | as | Monaco, TWR | 9870eu | |

0700 UTC - 3AM EDT / 2AM CDT / 12AM PDT

| | | | | | |
|------|------|-------|---------------------------------|----------|----------|
| 0700 | 0705 | | New Zealand, Radio NZ Intl | 9615pa | |
| 0700 | 0720 | | UK, BBC World Service | 6190af | 11765af |
| | | | 11940af | 15400af | |
| 0700 | 0720 | as | UK, BBC World Service | 17885af | |
| 0700 | 0726 | | Romania, Radio Romania Intl | 11830na | 15150na |
| 0700 | 0727 | | Czech Rep, Radio Prague Intl | 9880eu | 11600eu |
| 0700 | 0730 | | Belgium, Radio Vlaanderen Intl | 5985eu | |
| 0700 | 0730 | a | Tibet, Xizang PBS | 6110as | 9490as |
| 0700 | 0730 | | UK, BBC World Service | 15565me | 15575me |
| 0700 | 0750 | as | Albania, TWR | 11865eu | |
| 0700 | 0750 | as | Monaco, TWR | 9870eu | |
| 0700 | 0800 | | Anguilla, Caribbean Beacon | 6090am | |
| 0700 | 0800 | | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0700 | 0800 | | Australia, ABC NT Katherine | 5025do | |
| 0700 | 0800 | | Australia, ABC NT Tennant Creek | 4910do | |
| 0700 | 0800 | | Australia, HCJB | 11750pa | |
| 0700 | 0800 | | Australia, Radio | 9580pa | 9660pa |
| | | | 12080va | 13630pa | 15160pa |
| | | | 15415va | 15515as | 17750as |
| 0700 | 0800 | | Canada, CFRX Toronto ON | 6070do | |
| 0700 | 0800 | | Canada, CFVP Calgary AB | 6030do | |
| 0700 | 0800 | | Canada, CKZN St John's NF | 6160do | |
| 0700 | 0800 | | Canada, CKZU Vancouver BC | 6160do | |
| 0700 | 0800 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am | 9725sa | 11870sa |
| 0700 | 0800 | | Eqt Guinea, Radio Africa | 15184af | |
| 0700 | 0800 | | France, Radio France Intl | 15605af | |
| 0700 | 0800 | | Germany, Deutsche Welle | 6140eu | 21675af |
| 0700 | 0800 | DRM | Germany, Deutsche Welle | 21675eu | |
| 0700 | 0800 | vl | Ghana, Ghana BC Corp | 3366do | 4915do |
| 0700 | 0800 | | Guyana, Voice of | 3290do | 5950do |
| 0700 | 0800 | vl/as | Italy, IRRS | 13840va | |
| 0700 | 0800 | | Liberia, ELWA | 4760do | |
| 0700 | 0800 | | Malaysia, Radio Malaysia | 7295do | |
| 0700 | 0800 | | Malaysia, Voice of | 6175as | 9750as |
| 0700 | 0800 | | Myanmar, Radio | 9730do | |
| 0700 | 0800 | | Nigeria, Radio Enugu | 6025do | |
| 0700 | 0800 | | Nigeria, Radio/Ibadan | 6050do | |
| 0700 | 0800 | | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 0700 | 0800 | | Nigeria, Radio/Lagos | 3326do | 4990do |
| 0700 | 0800 | | Nigeria, Voice of | 7255af | 15120af |
| 0700 | 0800 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 0700 | 0800 | | Russia, Voice of | 17495pa | 17525pa |
| | | | 21790pa | | 17635pa |
| 0700 | 0800 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0700 | 0800 | | Singapore, Mediacorp Radio | 6150do | |
| 0700 | 0800 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0700 | 0800 | | South Africa, Channel Africa | 11825af | |
| 0700 | 0800 | | Swaziland, TWR | 7205af | 9500af |
| 0700 | 0800 | | Taiwan, Radio Taiwan Intl | 5950na | |
| 0700 | 0800 | | UK, BBC World Service | 11955as | 15310as |
| | | | 15360as | 15545af | 17760as |
| | | | 21660as | | 17790as |
| 0700 | 0800 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb | 6350usb | 7507usb |
| | | | 12133usb | 12579usb | 13362usb |
| 0700 | 0800 | | USA, KALJ Dallas TX | 5755va | |
| 0700 | 0800 | | USA, KTBN Salt Lake City UT | 7505na | |
| 0700 | 0800 | | USA, KVOH Rancho Simi CA | 9975as | |
| 0700 | 0800 | | USA, KWHR Naalehu HI | 11565as | 17780as |
| 0700 | 0800 | | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| 0700 | 0800 | | USA, WBOH Newport NC | 5920am | |
| 0700 | 0800 | | USA, WEWN Birmingham AL | 5825na | 7425na |
| | | | 7580na | 11875va | |
| 0700 | 0800 | | USA, WHRA Greenbush ME | 11730na | |
| 0700 | 0800 | | USA, WHRI Noblesville IN | 7315am | 7535am |
| 0700 | 0800 | | USA, WMLK Bethel PA | 9465eu | 9955al |

Shortwave Guide



| | | | | | |
|------|------|-------|-------------------------------|---------|---------|
| 0700 | 0800 | | USA, WRMI Miami FL | 7385am | 9955am |
| 0700 | 0800 | | USA, WTJC Newport NC | 9370na | |
| 0700 | 0800 | | USA, WWCN Nashville TN | 3210na | 5070na |
| | | | 5770na | 5935na | |
| 0700 | 0800 | | USA, WYFR Okeechobee FL | 9715va | 9930va |
| 0700 | 0800 | vl | Vanuatu, Radio | 4960do | 7260do |
| 0700 | 0800 | | Zambia, Radio Christian Voice | 9865af | |
| 0706 | 0800 | | New Zealand, Radio NZ Intl | 9885pa | |
| 0715 | 0800 | mtwhf | Albania, TWR | 11865eu | |
| 0715 | 0800 | mtwhf | Monaco, TWR | 9870eu | |
| 0720 | 0800 | | UK, BBC World Service | 6190af | 11765af |
| | | | 11940af | 15400af | |
| 0730 | 0745 | | Vatican City, Vatican Radio | 4005va | 5890va |
| | | | 6185va | 7250va | 9645va |
| | | | 15595va | | 11740va |
| 0730 | 0800 | | Georgia, Radio Georgia | 11910eu | |
| 0730 | 0800 | as | Guam, TWR/KTWR | 15205as | |
| 0730 | 0800 | as | UK, BBC World Service | 15575me | 17885af |
| 0730 | 0800 | | UK, BBC World Service | 11760me | 15565me |
| 0740 | 0800 | mtwhf | Guam, TWR/KTWR | 15205as | |
| 0745 | 0800 | mtwhf | Guam, TWR/KTWR | 11840as | |
| 0755 | 0800 | s | Monaco, TWR | 9870eu | |

0800 UTC - 4AM EDT / 3AM CDT / 1AM PDT

| | | | | | |
|------|------|--------|---------------------------------|----------|----------|
| 0800 | 0820 | smtwhf | Albania, TWR | 11865eu | |
| 0800 | 0820 | mtwhfs | Monaco, TWR | 9870eu | |
| 0800 | 0830 | | Australia, ABC NT Katherine | 5025do | |
| 0800 | 0830 | | Australia, ABC NT Tennant Creek | 4910do | |
| 0800 | 0830 | | Malaysia, Voice of | 6175as | 9750as |
| 0800 | 0830 | | Myanmar, Radio | 9730do | |
| 0800 | 0900 | | Anguilla, Caribbean Beacon | 6090am | |
| 0800 | 0900 | | Australia, ABC NT Alice Springs | 2310irr | 4835do |
| 0800 | 0900 | | Australia, HCJB | 11750pa | |
| 0800 | 0900 | | Australia, Radio | 5995pa | 9590as |
| | | | 9710pa | 12080va | 15415as |
| | | | 15515va | 17750as | |
| 0800 | 0900 | | Canada, CFRX Toronto ON | 6070do | |
| 0800 | 0900 | | Canada, CFVP Calgary AB | 6030do | |
| 0800 | 0900 | | Canada, CKZN St John's NF | 6160do | |
| 0800 | 0900 | | Canada, CKZU Vancouver BC | 6160do | |
| 0800 | 0900 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am | 9725sa | 11870sa |
| 0800 | 0900 | | Eat Guinea, Radio Africa | 15184af | |
| 0800 | 0900 | | Germany, Deutsche Welle | 6140eu | 21675af |
| 0800 | 0900 | DRM | Germany, Deutsche Welle | 15440af | |
| 0800 | 0900 | vl | Ghana, Ghana BC Corp | 3366do | 4915do |
| 0800 | 0900 | | Guam, TWR/KTWR | 15205as | |
| 0800 | 0900 | mtwhf | Guam, TWR/KTWR | 11840as | |
| 0800 | 0900 | | Guyana, Voice of | 3290do | 5950do |
| 0800 | 0900 | | Indonesia, Voice of | 9525as | 11785as |
| 0800 | 0900 | vl/as | Italy, IRRS | 13840va | |
| 0800 | 0900 | | Liberia, ELWA | 4760do | |
| 0800 | 0900 | | Malaysia, Radio Malaysia | 7295do | |
| 0800 | 0900 | | New Zealand, Radio NZ Intl | 9885pa | |
| 0800 | 0900 | | Nigeria, Radio Enugu | 6025do | |
| 0800 | 0900 | | Nigeria, Radio/Ibadan | 6050do | |
| 0800 | 0900 | | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 0800 | 0900 | | Nigeria, Radio/Lagos | 3326do | 4990do |
| 0800 | 0900 | | Nigeria, Voice of | 7255af | 15120af |
| 0800 | 0900 | vl | Pakistan, Radio | 15100eu | 17835eu |
| 0800 | 0900 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 0800 | 0900 | | Russia, Voice of | 17495pa | 17525pa |
| | | | 21790pa | | |
| 0800 | 0900 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 0800 | 0900 | | Singapore, Mediacorp Radio | 6150do | |
| 0800 | 0900 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0800 | 0900 | | South Korea, Radio Korea Intl | 13670eu | |
| 0800 | 0900 | | Swaziland, TWR | 7205af | 9500af |
| 0800 | 0900 | | Taiwan, Radio Taiwan Intl | 9610au | |
| 0800 | 0900 | | UK, BBC World Service | 6190af | 11760me |
| | | | 11955as | 12095eu | 15310as |
| | | | 15400af | 15485eu | 15565me |
| | | | 17760as | 17790as | 17830af |
| | | | 21660as | | 21470af |
| 0800 | 0900 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb | 6350usb | 7507usb |
| | | | 12133usb | 12579usb | 13362usb |
| 0800 | 0900 | | USA, KAIJ Dallas TX | 5755va | |
| 0800 | 0900 | | USA, KNLS Anchor Point AK | 11765as | |
| 0800 | 0900 | | USA, KTBN Salt Lake City UT | 7505na | |
| 0800 | 0900 | | USA, KWHR Naalehu HI | 11565as | 17780as |
| 0800 | 0900 | | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| 0800 | 0900 | | USA, WBOH Newport NC | 5920am | |
| 0800 | 0900 | | USA, WEWN Birmingham AL | 5825na | 7425na |
| | | | 7580na | 11875va | |
| 0800 | 0900 | | USA, WHRI Noblesville IN | 7315am | 7535am |
| 0800 | 0900 | | USA, WJIE Louisville KY | 7490am | 13595am |
| 0800 | 0900 | | USA, WMLK Bethel PA | 9465eu | 9955al |

| | | | | | |
|------|------|----|---------------------------------|---------|---------|
| 0800 | 0900 | | USA, WRMI Miami FL | 7385am | 9955am |
| 0800 | 0900 | | USA, WTJC Newport NC | 9370na | |
| 0800 | 0900 | | USA, WWCN Nashville TN | 3210na | 5070na |
| | | | 5770na | 5935na | |
| 0800 | 0900 | | USA, WYFR Okeechobee FL | 9590af | 9930af |
| 0800 | 0900 | vl | Vanuatu, Radio | 4960do | 7260do |
| 0800 | 0900 | | Zambia, Radio Christian Voice | 9865af | |
| 0805 | 0900 | s | Greece, Voice of | 9420eu | 15630eu |
| 0815 | 0900 | as | Guam, TWR/KTWR | 15330as | |
| 0830 | 0850 | | Bangladesh, Bangla Betar | 7185as | 9550as |
| 0830 | 0900 | | Australia, ABC NT Katherine | 2485do | |
| 0830 | 0900 | | Australia, ABC NT Tennant Creek | 2325do | |
| 0830 | 0900 | | Georgia, Radio Georgia | 11910me | |
| 0830 | 0900 | | Lithuania, Radio Vilnius | 9710eu | |

0900 UTC - 5AM EDT / 4AM CDT / 2AM PDT

| | | | | | |
|------|------|----------|---------------------------------|----------|----------|
| 0900 | 0915 | vl | Ghana, Ghana BC Corp | 3366do | 4915do |
| 0900 | 0929 | | Czech Rep, Radio Prague Intl | 21745va | |
| 0900 | 0930 | | Guam, TWR/KTWR | 11840as | |
| 0900 | 0930 | | Russia, Radio Ezra | 17590va | |
| 0900 | 1000 | | Anguilla, Caribbean Beacon | 6090am | |
| 0900 | 1000 | | Australia, ABC NT Alice Springs | 2310do | 4835irr |
| 0900 | 1000 | | Australia, ABC NT Katherine | 2485do | |
| 0900 | 1000 | | Australia, ABC NT Tennant Creek | 2325do | |
| 0900 | 1000 | | Australia, HCJB | 11750pa | |
| 0900 | 1000 | | Australia, Radio | 9580va | 9590as |
| | | | 12080va | 13630pa | 15415as |
| 0900 | 1000 | | Australia, Voice Intl | 11955as | 13685as |
| 0900 | 1000 | | Canada, CFRX Toronto ON | 6070do | |
| 0900 | 1000 | | Canada, CFVP Calgary AB | 6030do | |
| 0900 | 1000 | | Canada, CKZN St John's NF | 6160do | |
| 0900 | 1000 | | Canada, CKZU Vancouver BC | 6160do | |
| 0900 | 1000 | | China, China Radio Intl | 15210pa | 17490va |
| | | | 17650va | | |
| 0900 | 1000 | | Costa Rica, University Network | 5030am | 6150am |
| | | | 7375am | 9725sa | 11870am |
| 0900 | 1000 | | Eat Guinea, Radio Africa | 15184af | |
| 0900 | 1000 | DRM/ m-f | Germany, Deutsche Welle | 15440af | 17700af |
| 0900 | 1000 | | Germany, Deutsche Welle | 6140eu | 21675af |
| 0900 | 1000 | | Guyana, Voice of | 3290do | 5950do |
| 0900 | 1000 | vl/as | Italy, IRRS | 13840va | |
| 0900 | 1000 | | Malaysia, Radio Malaysia | 7295do | |
| 0900 | 1000 | | Malaysia, Voice of | 15295as | |
| 0900 | 1000 | DRM | Netherlands, Radio | 9815eu | |
| 0900 | 1000 | | New Zealand, Radio NZ Intl | 9885pa | |
| 0900 | 1000 | | Nigeria, Radio Enugu | 6025do | |
| 0900 | 1000 | | Nigeria, Radio/Ibadan | 6050do | |
| 0900 | 1000 | | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 0900 | 1000 | | Nigeria, Radio/Lagos | 3326do | 4990do |
| 0900 | 1000 | | Nigeria, Voice of | 7255af | 15120af |
| 0900 | 1000 | vl | Pakistan, Radio | 15100eu | 17835eu |
| 0900 | 1000 | | Palau, KHBN | 15725as | |
| 0900 | 1000 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 0900 | 1000 | | Singapore, Mediacorp Radio | 6150do | |
| 0900 | 1000 | vl | Solomon Islands, SIBC | 5020do | 9545do |
| 0900 | 1000 | s | UAE, Radio UNMEE | 21460af | |
| 0900 | 1000 | | UK, BBC World Service | 6195as | 9605as |
| | | | 9740as | 11760me | 15190ca |
| | | | 15360as | 15485eu | 15575me |
| | | | 17760as | 17790as | 17830af |
| 0900 | 1000 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb | 6350usb | 7507usb |
| | | | 12133usb | 12579usb | 13362usb |
| 0900 | 1000 | | USA, KAIJ Dallas TX | 5755va | |
| 0900 | 1000 | | USA, KTBN Salt Lake City UT | 7505na | |
| 0900 | 1000 | | USA, KWHR Naalehu HI | 11565as | 17780as |
| 0900 | 1000 | | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| 0900 | 1000 | | USA, WBOH Newport NC | 5920am | |
| 0900 | 1000 | | USA, WEWN Birmingham AL | 5825na | 7425na |
| | | | 11875na | | |
| 0900 | 1000 | | USA, WHRA Greenbush ME | 11730na | |
| 0900 | 1000 | | USA, WHRI Noblesville IN | 7315am | 7535am |
| 0900 | 1000 | | USA, WJIE Louisville KY | 7490am | 13595am |
| 0900 | 1000 | | USA, WRMI Miami FL | 7385am | 9955am |
| 0900 | 1000 | | USA, WTJC Newport NC | 9370na | |
| 0900 | 1000 | | USA, WWCN Nashville TN | 5070na | 5770na |
| | | | 5935na | 9475na | |
| 0900 | 1000 | | USA, WYFR Okeechobee FL | 9590na | |
| 0900 | 1000 | vl | Vanuatu, Radio | 4960do | 7260do |
| 0900 | 1000 | | Zambia, Radio Christian Voice | 9865af | |
| 0910 | 0930 | s | Armenia, Voice of | 4810eu | 15270as |
| 0930 | 1000 | smwhfa | Greece, Voice of | 9420eu | 15630eu |

1000 UTC - 6AM EDT / 5AM CDT / 3AM PDT

| | | | | | |
|------|------|--|-------------------------|---------|---------|
| 1000 | 1029 | | Germany, Deutsche Welle | 15190as | 15350as |
| | | | 17820as | | |

Shortwave Guide



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|------|------|----------|---------------------------------|----------|----------|----------|
| 1000 | 1030 | | Guam, AWR/KSDA | 11560as | 11930as | |
| 1000 | 1030 | | Mongolia, Voice of | 12085as | | |
| 1000 | 1030 | | UK, BBC World Service | 6195as | 9605as | |
| | | | 9740as 15310as | 15360as | 17760as | |
| | | | 17790as | 21660as | | |
| 1000 | 1059 | | New Zealand, Radio NZ Intl | 9885pa | | |
| 1000 | 1100 | | Anguilla, Caribbean Beacon | 11775am | | |
| 1000 | 1100 | | Australia, ABC NT Alice Springs | 2310do | 4835irr | |
| 1000 | 1100 | | Australia, ABC NT Katherine | 2485do | | |
| 1000 | 1100 | | Australia, ABC NT Tennant Creek | 2325do | | |
| 1000 | 1100 | | Australia, HCJB | 15425as | | |
| 1000 | 1100 | | Australia, Radio | 5995pa | 6020pa | 6035va |
| | | | 9475as 9560as | 9580va | 9590as | 11880va |
| | | | 12080as | 13630pa | | |
| 1000 | 1100 | | Australia, Voice Intl | 11955as | 13685as | |
| 1000 | 1100 | | Canada, CFRX Toronto ON | 6070do | | |
| 1000 | 1100 | | Canada, CFVP Calgary AB | 6030do | | |
| 1000 | 1100 | | Canada, CKZN St John's NF | 6160do | | |
| 1000 | 1100 | | Canada, CKZU Vancouver BC | 6160do | | |
| 1000 | 1100 | | China, China Radio Intl | 6040na | 17490va | |
| | | | 17650va | | | |
| 1000 | 1100 | | Costa Rica, University Network | 5030am | 6150am | |
| | | | 7375am | 9725sa | 11870am | 13750na |
| 1000 | 1100 | | Eqt Guinea, Radio Africa | 15184af | | |
| 1000 | 1100 | DRM/ m-f | Germany, Deutsche Welle | 15440eu | 17700eu | |
| 1000 | 1100 | | Guyana, Voice of | 3290do | 5950do | |
| 1000 | 1100 | | India, All India Radio | 13695as | 15020as | |
| | | | 15260as | 15410as | 17510au | 17800as |
| | | | 17895as | | | |
| 1000 | 1100 | vl/as | Italy, IRRS | 13840va | | |
| 1000 | 1100 | | Japan, Radio | 6120ca | 9695as | 11730as |
| | | | 17585eu | 17720va | 21755va | |
| 1000 | 1100 | vl | Libya, Voice of Africa | 21695af | | |
| 1000 | 1100 | | Malaysia, Radio Malaysia | 7295do | | |
| 1000 | 1100 | | Malaysia, Voice of | 15295as | | |
| 1000 | 1100 | DRM | Netherlands, Radio | 9815eu | | |
| 1000 | 1100 | | Netherlands, Radio | 9785au | 12065as | 13710as |
| | | | 13820as | | | |
| 1000 | 1100 | | Nigeria, Voice of | 7255af | 15120af | |
| 1000 | 1100 | | North Korea, Voice of | 11735na | 3560as | 11710am |
| | | | 11735na | 13650as | 15180as | |
| 1000 | 1100 | | Palau, KHBN | 15725as | | |
| 1000 | 1100 | | Papua New Guinea, NBC | 4890do | 9675irr | |
| 1000 | 1100 | | Singapore, Mediacorp Radio | 6150do | | |
| 1000 | 1100 | vl | Solomon Islands, SIBC | 5020do | 9545do | |
| 1000 | 1100 | | South Africa, Channel Africa | 11825af | | |
| 1000 | 1100 | | UK, BBC World Service | 6190af | 11940af | |
| | | | 12095eu | 15485eu | 17885af | 21470af |
| 1000 | 1100 | as | UK, BBC World Service | 15190ca | 15400af | |
| | | | 17830af | | | |
| 1000 | 1100 | DRM/ m | UK, Christian Voice | 9760eu | | |
| 1000 | 1100 | | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb | 13855usb |
| 1000 | 1100 | | USA, KAIJ Dallas TX | 5755va | | |
| 1000 | 1100 | | USA, KTNB Salt Lake City UT | 7505na | | |
| 1000 | 1100 | | USA, KWHR Naalehu HI | 9930as | 11565as | |
| 1000 | 1100 | | USA, WBCQ Kennebunk ME | 5105na | | |
| 1000 | 1100 | | USA, WBOH Newport NC | 5920am | | |
| 1000 | 1100 | | USA, WEWN Birmingham AL | 7425na | 7520na | |
| | | | 11875na | | | |
| 1000 | 1100 | | USA, WHRI Noblesville IN | 7315am | 7535am | |
| 1000 | 1100 | | USA, WINB Red Lion PA | 9320am | | |
| 1000 | 1100 | | USA, WJIE Louisville KY | 7490am | 13595am | |
| 1000 | 1100 | | USA, WRMI Miami FL | 7385am | 9955am | |
| 1000 | 1100 | | USA, WTJC Newport NC | 9370na | | |
| 1000 | 1100 | | USA, WWCR Nashville TN | 5070na | 5935na | |
| | | | 15825na | | | |
| 1000 | 1100 | | USA, WYFR Okeechobee FL | 5950na | 9755sa | |
| 1000 | 1100 | vl | Vanuatu, Radio | 4960do | 7260do | |
| 1000 | 1100 | | Zambia, Radio Christian Voice | 9865af | | |
| 1010 | 1020 | | Israel, Kol Israel | 15640va | 17535va | |
| 1015 | 1100 | | Guam, TWR/KTWR | 9865as | | |
| 1030 | 1045 | mtwhf | Ethiopia, Radio | 5990do | 7110do | 9704do |
| 1030 | 1057 | | Czech Rep, Radio Prague Intl | 9880eu | 11615eu | |
| 1030 | 1100 | mt hfa | Guam, AWR/KSDA | 11900as | | |
| 1030 | 1100 | | Iran, Voice of the Islamic Rep | 15600as | 17660as | |
| 1030 | 1100 | | UAE, Radio Dubai | 13675va | 15370va | 15395va |
| | | | 21605eu | | | |
| 1030 | 1100 | t | UAE, Radio UNMEE21550af | | | |
| 1030 | 1100 | | UK, BBC World Service | 6195as | 9740as | |
| | | | 15310as | 17760as | 17790as | |
| 1030 | 1100 | | Vatican City, Vatican Radio | 5890eu | | |

1100 UTC - 7AM EDT / 6AM CDT / 4AM PDT

| | | | | | | |
|------|------|-----------|-------------------|---------|---------|--------|
| 1100 | 1105 | vl | Pakistan, Radio | 15100eu | 17835eu | |
| 1100 | 1115 | mtwhfa.vl | Vanuatu, Radio | 4960do | 7260do | |
| 1100 | 1128 | | Vietnam, Voice of | 7285as | | |
| 1100 | 1130 | | Tibet, Xizang PBS | 4920as | 6110as | 9490as |

| | | | | | | |
|------|------|-------|---------------------------------|----------|----------|----------|
| 1100 | 1130 | t | UAE, Radio UNMEE21550af | | | |
| 1100 | 1130 | | UK, BBC World Service | 6190af | 6195ca | |
| | | | 11940af | 15190ca | 15400af | 17790ca |
| | | | 17830af | 17885af | 21470af | |
| 1100 | 1159 | | Germany, Deutsche Welle | 15105as | 17820as | |
| | | | 21650as | 21820as | | |
| 1100 | 1200 | | Anguilla, Caribbean Beacon | 11775am | | |
| 1100 | 1200 | | Australia, ABC NT Alice Springs | 2310do | 4835irr | |
| 1100 | 1200 | | Australia, ABC NT Katherine | 2485do | | |
| 1100 | 1200 | | Australia, ABC NT Tennant Creek | 2325do | | |
| 1100 | 1200 | | Australia, HCJB | 15425as | | |
| 1100 | 1200 | | Australia, Radio | 5995pa | 6020pa | 6035va |
| | | | 9475as 9560as | 9590va | 9590as | 11880va |
| | | | 12080as | | | |
| 1100 | 1200 | | Australia, Voice Intl | 13685as | | |
| 1100 | 1200 | | Canada, CFRX Toronto ON | 6070do | | |
| 1100 | 1200 | | Canada, CFVP Calgary AB | 6030do | | |
| 1100 | 1200 | | Canada, CKZN St John's NF | 6160do | | |
| 1100 | 1200 | | Canada, CKZU Vancouver BC | 6160do | | |
| 1100 | 1200 | | China, China Radio Intl | 6040am | 11750ca | |
| | | | 17490am | 17650am | | |
| 1100 | 1200 | | Costa Rica, University Network | 5030am | 6150am | |
| | | | 7375am | 9725sa | 11870am | 13750na |
| 1100 | 1200 | | Ecuador, HCJB | 12005va | 21455am | |
| 1100 | 1200 | DRM | Germany, Deutsche Welle | 15440eu | | |
| 1100 | 1200 | | Iran, Voice of the Islamic Rep | 15600as | 17660as | |
| 1100 | 1200 | vl/as | Italy, IRRS | 13840va | | |
| 1100 | 1200 | f | Italy, IRRS | 15665af | | |
| 1100 | 1200 | | Japan, Radio | 6120na | 9695as | 11730as |
| | | | 17585eu | | | |
| 1100 | 1200 | vl | Libya, Voice of Africa | 21675af | 15610af | 17695af |
| | | | 21675af | 21695af | | |
| 1100 | 1200 | | Malaysia, Radio Malaysia | 7295do | | |
| 1100 | 1200 | | Malaysia, Voice of | 15295as | | |
| 1100 | 1200 | | Netherlands, Radio | 11675na | | |
| 1100 | 1200 | | New Zealand, Radio NZ Intl | 9885pa | | |
| 1100 | 1200 | | Papua New Guinea, NBC | 4890do | 9675irr | |
| 1100 | 1200 | | Singapore, Radio Singapore Intl | 6080as | 6150as | |
| 1100 | 1200 | | South Africa, Channel Africa | 11825af | | |
| 1100 | 1200 | | Taiwan, Radio Taiwan Intl | 7445as | | |
| 1100 | 1200 | | UK, BBC World Service | 6195as | 9740as | |
| | | | 12095eu | 15310as | 15485eu | 17760as |
| | | | 17790as | | | |
| 1100 | 1200 | | Ukraine, Radio Ukraine Intl | 15415eu | | |
| 1100 | 1200 | | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb | 13855usb |
| 1100 | 1200 | | USA, KAIJ Dallas TX | 5755va | | |
| 1100 | 1200 | | USA, KTNB Salt Lake City UT | 7505na | | |
| 1100 | 1200 | | USA, KWHR Naalehu HI | 9930as | 11565as | |
| 1100 | 1200 | | USA, WBCQ Kennebunk ME | 5105na | | |
| 1100 | 1200 | | USA, WBOH Newport NC | 5920am | | |
| 1100 | 1200 | | USA, WEWN Birmingham AL | 7425na | 7520na | |
| | | | 11875na | | | |
| 1100 | 1200 | | USA, WHRI Noblesville IN | 7315am | 7535am | |
| 1100 | 1200 | | USA, WINB Red Lion PA | 9320am | | |
| 1100 | 1200 | | USA, WJIE Louisville KY | 7490am | 13595am | |
| 1130 | 1200 | | USA, WRMI Miami FL | 7385am | 9955am | |
| 1130 | 1200 | | USA, WTJC Newport NC | 9370na | | |
| 1130 | 1200 | | USA, WWCR Nashville TN | 5070na | 5935na | |
| | | | 15825na | | | |
| 1100 | 1200 | | USA, WYFR Okeechobee FL | 5950na | 9755sa | |
| 1100 | 1200 | | USA, WYFR Okeechobee FL | 6015na | 7355na | |
| 1100 | 1200 | | Zambia, Radio Christian Voice | 9865af | | |
| 1130 | 1200 | | Belgium, Radio Vlaanderen Intl | 9940as | | |
| 1130 | 1200 | | Bulgaria, Radio | 11700eu | 15700eu | |
| 1130 | 1200 | | UK, BBC World Service | 6190af | 6195ca | |
| | | | 11940af | 15190ca | 17830af | 17885af |
| | | | 21470af | | | |
| 1130 | 1200 | f | Vatican City, Vatican Radio | 15595va | 17515va | |
| 1145 | 1155 | | Rwanda, Radio | 6055do | | |

1200 UTC - 8AM EDT / 7AM CDT / 5AM PDT

| | | | | | | |
|------|------|-----|---------------------------------|---------|---------|--|
| 1200 | 1215 | vl | Cambodia, National Radio Of | 11940as | | |
| 1200 | 1230 | | France, Radio France Intl | 17815af | 25820af | |
| 1200 | 1230 | vl | Libya, Voice of Africa | 15610af | 17695af | |
| | | | 21675af | 21695af | | |
| 1200 | 1230 | | Malaysia, Voice of | 15295as | | |
| 1200 | 1230 | | UAE, AWR Africa | 15135as | | |
| 1200 | 1230 | | Uzbekistan, Radio Tashkent Intl | 7285as | 9715as | |
| | | | 15295as | 17775as | | |
| 1200 | 1259 | m-f | Canada, Radio Canada Intl | 9515am | 15190as | |
| | | | 13655am | 15190as | 17800am | |
| 1200 | 1259 | | New Zealand, Radio NZ Intl | 9885pa | | |
| 1200 | 1259 | | Poland, Radio Polonia | 9525eu | 11820eu | |
| 1200 | 1300 | | Anguilla, Caribbean Beacon | 11775am | | |
| 1200 | 1300 | | Australia, ABC NT Alice Springs | 2310do | 4835irr | |
| 1200 | 1300 | | Australia, ABC NT Katherine | 2485do | | |
| 1200 | 1300 | | Australia, ABC NT Tennant Creek | 2325do | | |

Shortwave Guide



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|------|------|-------|---------------------------------|----------|----------|----------|
| 1200 | 1300 | | Australia, HCJB | 15435as | | |
| 1200 | 1300 | | Australia, Radio | 5995pa | 6020pa | 6035va |
| | | | 9475as 9560as | 9590as | 11880as | |
| 1200 | 1300 | | Australia, Voice Intl | 13685as | | |
| 1200 | 1300 | | Canada, CBC Northern Service | 9625do | | |
| 1200 | 1300 | | Canada, CFRX Toronto ON | 6070do | | |
| 1200 | 1300 | | Canada, CFVP Calgary AB | 6030do | | |
| 1200 | 1300 | | Canada, CKZN St John's NF | 6160do | | |
| 1200 | 1300 | | Canada, CKZU Vancouver BC | 6160do | | |
| 1200 | 1300 | | China, China Radio Intl | 9730as | 9795va | |
| | | | 11760pa | 11980pa | 15415as | 17490va |
| | | | 17650va | | | |
| 1200 | 1300 | | Costa Rica, University Network | 9725am | 11870am | |
| | | | 13750am | | | |
| 1200 | 1300 | | Ecuador, HCJB | 12005va | 21455am | |
| 1200 | 1300 | DRM | Germany, Deutsche Welle | 9655eu | 15440eu | |
| 1200 | 1300 | 2nd s | Germany, Overcomer Ministries | 6110eu | | |
| 1200 | 1300 | | Malaysia, Radio Malaysia | 7295do | | |
| 1200 | 1300 | DRM | Netherlands, Radio | 9815eu | | |
| 1200 | 1300 | | Papua New Guinea, NBC | 4890do | 9675irr | |
| 1200 | 1300 | | Singapore, Radio Singapore Intl | 6080as | 6150as | |
| 1200 | 1300 | | South Korea, Radio Korea Intl | 9650ca | | |
| 1200 | 1300 | | Taiwan, Radio Taiwan Intl | 7130as | | |
| 1200 | 1300 | | UK, BBC World Service | 6195va | 9740as | |
| | | | 12095eu | 15190ca | 15310as | 15485eu |
| | | | 17760as | 17790as | | |
| 1200 | 1300 | | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb | 13855usb |
| 1200 | 1300 | | USA, KALJ Dallas TX | 13815va | | |
| 1200 | 1300 | | USA, KTNB Salt Lake City UT | 7505na | | |
| 1200 | 1300 | | USA, KWHR Naalehu HI | 9930as | 11565as | |
| 1200 | 1300 | | USA, KWHR Naalehu HI | 9930as | 11565as | |
| 1200 | 1300 | | USA, Voice of America | 6160va | 9645va | |
| | | | 9760va | 15240va | | |
| 1200 | 1300 | | USA, WBCQ Kennebunk ME | 9330na | 17495na | |
| 1200 | 1300 | | USA, WBOH Newport NC | 5920am | | |
| 1200 | 1300 | | USA, WEWN Birmingham AL | 7425na | 7520na | |
| | | | 9355na | 13615na | | |
| 1200 | 1300 | | USA, WHRI Noblesville IN | 7315am | 11670am | |
| 1200 | 1300 | | USA, WINB Red Lion PA | 13570am | | |
| 1200 | 1300 | | USA, WJIE Louisville KY | 7490am | 13595am | |
| 1200 | 1300 | | USA, WRMI Miami FL | 9955am | 15725am | |
| 1200 | 1300 | | USA, WTJC Newport NC | 9370na | | |
| 1200 | 1300 | | USA, WWCR Nashville TN | 7465na | 9985na | |
| | | | 13845na | 15825na | | |
| 1200 | 1300 | | USA, WWRB Manchester TN | 9320na | 12170na | |
| 1200 | 1300 | | USA, WYFR Okeechobee FL | 5850na | 5950na | |
| | | | 6015na | 17750na | | |
| 1200 | 1300 | | Zambia, Radio Christian Voice | 9865af | | |
| 1205 | 1215 | as | Austria, Radio Austria Intl | 6155eu | 13730eu | |
| | | | 17715va | | | |
| 1215 | 1230 | | Austria, Radio Austria Intl | 6155as | 13730eu | |
| | | | 17715va | | | |
| 1215 | 1230 | as | India, TWR | 7560as | | |
| 1215 | 1300 | | Egypt, Radio Cairo | 17670as | | |
| 1230 | 1258 | | Vietnam, Voice of | 9840va | 12020va | |
| 1230 | 1300 | | Bangladesh, Bangla Betar | 7185as | 9550as | |
| 1230 | 1300 | vl | Libya, Voice of Africa | 21675af | 21695af | |
| 1230 | 1300 | | Sri Lanka, SLBC | 6005as | 11930as | 15745as |
| 1230 | 1300 | | Sweden, Radio | 13580va | 15240na | 15735va |
| 1230 | 1300 | | Thailand, Radio | 9855va | | |
| 1230 | 1300 | | Turkey, Voice of | 15225va | 15535eu | |
| 1230 | 1300 | a | UK, Wales Radio Intl | 17745au | | |
| 1235 | 1245 | as | Austria, Radio Austria Intl | 6155eu | 13730eu | |
| | | | 17715va | | | |
| 1245 | 1300 | mtwhf | Austria, Radio Austria Intl | 17715as | | |
| 1245 | 1300 | as | Austria, Radio Austria Intl | 6155eu | 13730eu | |

1300 UTC - 9AM EDT / 8AM CDT / 6AM PDT

| | | | | | | |
|------|------|-----|------------------------------|---------|---------|---------|
| 1300 | 1329 | | Czech Rep, Radio Prague Intl | 13580eu | 21745af | |
| 1300 | 1330 | DRM | Canada, Radio Canada Intl | 9815eu | | |
| 1300 | 1330 | | Ecuador, HCJB | 12005va | 21455am | |
| 1300 | 1330 | | Egypt, Radio Cairo | 17670as | | |
| 1300 | 1330 | | Turkey, Voice of | 15255va | 15535eu | |
| 1300 | 1356 | | Romania, Radio Romania Intl | 11830eu | 15105eu | |
| 1300 | 1400 | | Anguilla, Caribbean Beacon | 11775am | | |
| 1300 | 1400 | | Australia, HCJB | 15435as | | |
| 1300 | 1400 | | Australia, Radio | 5995pa | 6020pa | 9475as |
| | | | 9560as 9580va | 11660as | | |
| 1300 | 1400 | | Canada, CBC Northern Service | 9625do | | |
| 1300 | 1400 | | Canada, CFRX Toronto ON | 6070do | | |
| 1300 | 1400 | | Canada, CFVP Calgary AB | 6030do | | |
| 1300 | 1400 | | Canada, CKZN St John's NF | 6160do | | |
| 1300 | 1400 | | Canada, CKZU Vancouver BC | 6160do | | |
| 1300 | 1400 | | Canada, Radio Canada Intl | 9515am | 13655am | |
| | | | 17800sa | | | |
| 1300 | 1400 | | China, China Radio Intl | 7405am | 9570am | |
| | | | 9795va | 11760pa | 11980as | 15180as |

| | | | | | | |
|------|------|--------|---------------------------------|----------|----------|----------|
| 1300 | 1400 | | 17490va | 17650va | 9725am | 11870am |
| | | | Costa Rica, University Network | 13750am | | |
| 1300 | 1400 | DRM | Germany, Deutsche Welle | 9655eu | 15440eu | |
| 1300 | 1400 | | Germany, Deutsche Welle | 6140eu | | |
| 1300 | 1400 | | Jordan, Radio | 11690eu | | |
| 1300 | 1400 | vl | Libya, Voice of Africa | 21675af | 21695af | |
| 1300 | 1400 | | Malaysia, Radio Malaysia | 7295do | | |
| 1300 | 1400 | | New Zealand, Radio NZ Intl | 6095pa | | |
| 1300 | 1400 | | North Korea, Voice of | 4405as | 9335eu | |
| | | | 11710na | 13760eu | 15245am | |
| 1300 | 1400 | | Papua New Guinea, NBC | 4890do | 9675irr | |
| 1300 | 1400 | | Singapore, Radio Singapore Intl | 6080as | 6150as | |
| 1300 | 1400 | | South Korea, Radio Korea Intl | 9570as | 9700as | |
| 1300 | 1400 | | Sri Lanka, SLBC | 6005as | 11930as | 15745as |
| 1300 | 1400 | | UK, BBC World Service | 6190af | 6195va | |
| | | | 9740as 11940af | 12095eu | 15190af | 15310as |
| | | | 15420af | 15485eu | 17760as | 17790as |
| | | | 17830af | 17885af | 21470af | |
| 1300 | 1400 | | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb | 13855usb |
| 1300 | 1400 | | USA, KJES Vado NM | 11715na | | |
| 1300 | 1400 | | USA, KNLS Anchor Point AK | 11870as | | |
| 1300 | 1400 | | USA, KTNB Salt Lake City UT | 7505na | | |
| 1300 | 1400 | | USA, KVOH Rancho Simi CA | 9975as | | |
| 1300 | 1400 | | USA, KWHR Naalehu HI | 9930as | 11565as | |
| 1300 | 1400 | | USA, Voice of America | 9645va | 9760va | |
| 1300 | 1400 | | USA, WBCQ Kennebunk ME | 9330na | 17495na | |
| 1300 | 1400 | | USA, WBOH Newport NC | 5920am | | |
| 1300 | 1400 | | USA, WEWN Birmingham AL | 7425na | 7520na | |
| | | | 9355na | 13615na | | |
| 1300 | 1400 | | USA, WHRA Greenbush ME | 17560na | | |
| 1300 | 1400 | | USA, WHRI Noblesville IN | 11670am | 15105am | |
| 1300 | 1400 | | USA, WINB Red Lion PA | 13570am | | |
| 1300 | 1400 | | USA, WJIE Louisville KY | 7490am | 13595am | |
| 1300 | 1400 | | USA, WRMI Miami FL | 9955am | 15725am | |
| 1300 | 1400 | | USA, WTJC Newport NC | 9370na | | |
| 1300 | 1400 | | USA, WWCR Nashville TN | 7465na | 9985na | |
| | | | 13845na | 15825na | | |
| 1300 | 1400 | | USA, WWRB Manchester TN | 9320na | 12170na | |
| 1300 | 1400 | | USA, WYFR Okeechobee FL | 11560na | 11830na | |
| | | | 11865as | 11970as | 13695na | 17750na |
| 1300 | 1400 | | Zambia, Radio Christian Voice | 9865af | | |
| 1305 | 1315 | mtwhfa | Turkmenistan, Turkmen Radio | 5015as | | |
| 1315 | 1330 | a | Russia, TWR | 9485eu | | |
| 1330 | 1400 | | Guam, AWR/KSDA | 11980as | | |
| 1330 | 1400 | mtwhfa | Guam, AWR/KSDA | 15275as | | |
| 1330 | 1400 | | India, All India Radio | 13710as | 9690as | 11620as |
| 1330 | 1400 | | Laos, National Radio | 7145as | | |
| 1330 | 1400 | DRM | Netherlands, Radio | 9815eu | | |
| 1330 | 1400 | | Sweden, Radio | 15240na | 15735va | |
| 1330 | 1400 | | UAE, Radio Dubai | 13630eu | 7620as | 15395eu |
| | | | 21605eu | | | |
| 1330 | 1400 | | Uzbekistan, Radio Tashkent Intl | 7285as | 9715as | |
| | | | 15295as | 17775as | | |

1400 UTC - 10AM EDT / 9AM CDT / 7AM PDT

| | | | | | | |
|------|------|----|--------------------------------|---------|---------|---------|
| 1400 | 1415 | | Russia, FEBA | 9495as | | |
| 1400 | 1415 | | Seychelles, FEBA | 9495as | | |
| 1400 | 1430 | | Australia, HCJB | 15435as | | |
| 1400 | 1430 | | Thailand, Radio | 9830as | | |
| 1400 | 1459 | as | Canada, Radio Canada Intl | 9515as | | |
| 1400 | 1500 | | Anguilla, Caribbean Beacon | 11775am | | |
| 1400 | 1500 | | Australia, Radio | 5995pa | 6080pa | 7260as |
| | | | 9475as 9590as | 11660as | 11750as | |
| 1400 | 1500 | | Canada, CBC Northern Service | 9625do | | |
| 1400 | 1500 | | Canada, CFRX Toronto ON | 6070do | | |
| 1400 | 1500 | | Canada, CFVP Calgary AB | 6030do | | |
| 1400 | 1500 | | Canada, CKZN St John's NF | 6160do | | |
| 1400 | 1500 | | Canada, CKZU Vancouver BC | 6160do | | |
| 1400 | 1500 | | Canada, Radio Canada Intl 9 | 515am | 13655am | |
| | | | 17800am | | | |
| 1400 | 1500 | | China, China Radio Intl | 7405am | 9610va | |
| | | | 9795va | 11675as | 11765af | 13685am |
| | | | 13680af | 15125am | 17490am | 17650am |
| 1400 | 1500 | | Costa Rica, University Network | 9725am | 11870am | |
| | | | 13750am | | | |
| 1400 | 1500 | | France, Radio France Intl | 7175as | 9580as | |
| | | | 11610as | 17515as | 17620as | |
| 1400 | 1500 | | Germany, Deutsche Welle | 6140eu | | |
| 1400 | 1500 | | Germany, Pan American BC | 15650eu | | |
| 1400 | 1500 | | India, All India Radio | 9690as | 11620as | |
| | | | 13710as | | | |
| 1400 | 1500 | | Japan, Radio | 7200as | 11730as | 11840pa |
| 1400 | 1500 | | Jordan, Radio | 11690eu | | |
| 1400 | 1500 | vl | Libya, Voice of Africa | 21675af | | |
| 1400 | 1500 | | Netherlands, Radio | 9890as | 11835as | 12075as |

Shortwave Guide



| | | | | | |
|------|------|-----|-------------------------------|----------|----------|
| 1400 | 1500 | | New Zealand, Radio NZ Intl | 6095pa | |
| 1400 | 1500 | | Oman, Radio | 15140eu | |
| 1400 | 1500 | DRM | Russia, Voice of | 15780va | |
| 1400 | 1500 | | Russia, Voice of | 7390as | 12055as |
| | | | 15605as | 15780as | |
| 1400 | 1500 | | Singapore, Mediacorp Radio | 6150do | |
| 1400 | 1500 | | South Africa, Channel Africa | 11825af | |
| 1400 | 1500 | | Sri Lanka, SLBC | 6005as | 15745as |
| 1400 | 1500 | | Taiwan, Radio Taiwan Intl | 15265as | |
| 1400 | 1500 | | UK, BBC World Service | 6190af | 6195as |
| | | | 7105as 9740as | 11940af | 12095eu |
| | | | 15310as | 15485eu | 15575me |
| | | | 17790as | 17830af | 21470af |
| | | | 21660af | | |
| 1400 | 1500 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | | 5765usb | 6350usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb |
| | | | | | 13855usb |
| 1400 | 1500 | | USA, KJES Vado NM | 11715na | |
| 1400 | 1500 | | USA, KTBN Salt Lake City UT | 7505na | 15590na |
| 1400 | 1500 | | USA, KWHR Naalehu HI | 9930as | 11565as |
| 1400 | 1500 | | USA, Voice of America | 6160va | 7125va |
| | | | 9760va | 15160va | 15425va |
| 1400 | 1500 | | USA, WBCQ Kennebunk ME | 17415na | 9330na |
| | | | 17495na | | |
| 1400 | 1500 | | USA, WBOH Newport NC | 5920am | |
| 1400 | 1500 | | USA, WEWN Birmingham AL | 7425na | 7520na |
| | | | 9355na | 9955na | |
| 1400 | 1500 | | USA, WHRA Greenbush ME | 15745na | |
| 1400 | 1500 | | USA, WHRI Noblesville IN | 17560na | |
| 1400 | 1500 | | USA, WINB Red Lion PA | 11670am | 15105am |
| 1400 | 1500 | | USA, WJIE Louisville KY | 13570am | |
| 1400 | 1500 | | USA, WRMI Miami FL | 7490am | 13595am |
| 1400 | 1500 | | USA, WTJC Newport NC | 7385am | 15725am |
| 1400 | 1500 | | USA, WWCN Nashville TN | 9370na | |
| | | | 13845na | 15825na | 9985na |
| 1400 | 1500 | | USA, WWRB Manchester TN | 7465na | |
| 1400 | 1500 | | USA, WYFR Okeechobee FL | 9320na | 12170na |
| | | | 11970na | 17750na | 11830as |
| 1400 | 1500 | | Zambia, Radio Christian Voice | 9865af | |
| 1415 | 1430 | | Nepal, Radio | 3230as | 6100as |
| | | | 7165as | | |
| 1430 | 1500 | | Myanmar, Radio | 5040do | 5985do |

1500 UTC - 11AM EDT / 10AM CDT / 8AM PDT

| | | | | | | |
|------|------|----|--------------------------------|----------|----------|----------|
| 1500 | 1528 | | Vietnam, Voice of | 7285va | 9840va | 12020va |
| 1500 | 1530 | s | Hungary, Radio Budapest | 6025eu | 9715eu | |
| 1500 | 1530 | | Mongolia, Voice of | 12085eu | | |
| 1500 | 1530 | | Sri Lanka, SLBC | 6005as | 11930as | 15745as |
| 1500 | 1530 | | UK, BBC World Service | 6190af | 11860af | |
| | | | 11940af | 15400af | 15420af | 17830af |
| | | | 21470af | 21490af | 21660af | |
| 1500 | 1557 | | Canada, Radio Canada Intl | 15455as | 17720as | |
| 1500 | 1559 | as | Canada, Radio Canada Intl | 9515am | 13655am | |
| | | | 17800am | | | |
| 1500 | 1600 | | Anguilla, Caribbean Beacon | 11775am | | |
| 1500 | 1600 | | Australia, Radio | 5995pa | 6080pa | 7260as |
| | | | 9475as 9590as | 11660as | 11750as | |
| 1500 | 1600 | | Canada, CBC Northern Service | 9625do | | |
| 1500 | 1600 | | Canada, CFRX Toronto ON | 6070do | | |
| 1500 | 1600 | | Canada, CFVP Calgary AB | 6030do | | |
| 1500 | 1600 | | Canada, CKZN St John's NF | 6160do | | |
| 1500 | 1600 | | Canada, CKZU Vancouver BC | 6160do | | |
| 1500 | 1600 | | China, China Radio Intl | 7160as | 9610va | |
| | | | 9785as 11940af | 13685am | 13640af | 15125af |
| | | | 17490va | 17650va | | |
| 1500 | 1600 | | Costa Rica, University Network | 9725am | 11870am | |
| | | | 13750am | | | |
| 1500 | 1600 | | Germany, Deutsche Welle | 6140eu | | |
| 1500 | 1600 | | Germany, Pan American BC | 15650me | | |
| 1500 | 1600 | | Guam, TWR/KTWR | 12105as | | |
| 1500 | 1600 | | Japan, Radio | 6190as | 7200am | 9505as |
| | | | 11730va | | | |
| 1500 | 1600 | | Jordan, Radio | 11690na | | |
| 1500 | 1600 | | Myanmar, Radio | 5040do | 5985do | |
| 1500 | 1600 | | New Zealand, Radio NZ Intl | 6095pa | | |
| 1500 | 1600 | | North Korea, Voice of | 4405eu | 9335eu | |
| | | | 11710na | 13760eu | 15245am | |
| 1500 | 1600 | | Russia, FEBA | 7350as | | |
| 1500 | 1600 | | Russia, Voice of | 4940me | 4965me | 4975me |
| | | | 7325me | 7390as | 11500as | 11985me |
| 1500 | 1600 | | Seychelles, FEBA | 7365as | | |
| 1500 | 1600 | | Singapore, Mediacorp Radio | 6150do | | |
| 1500 | 1600 | | South Africa, Channel Africa | 17770af | | |
| 1500 | 1600 | | UK, BBC World Service | 5975as | 6195as | |
| | | | 7105as 9740as | 12095eu | 15190ca | 15310as |
| | | | 15485eu | 15565me | 17790as | |
| 1500 | 1600 | | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb | 13855usb |

| | | | | | |
|------|------|----|-----------------------------------|---------|---------|
| 1500 | 1600 | | USA, KJES Vado NM | 11715na | |
| 1500 | 1600 | | USA, KTBN Salt Lake City UT | 15590na | |
| 1500 | 1600 | | USA, KVOH Rancho Simi CA | 17775as | |
| 1500 | 1600 | | USA, KWHR Naalehu HI | 9930as | 11565as |
| 1500 | 1600 | | USA, Voice of America | 6160af | 7125va |
| | | | 9590af 9760af | 9845af | 12040af |
| 1500 | 1600 | | USA, WBCQ Kennebunk ME | 7415na | 9330na |
| | | | 17495na | | |
| 1500 | 1600 | | USA, WBOH Newport NC | 5920am | |
| 1500 | 1600 | | USA, WEWN Birmingham AL | 9955na | 11530na |
| | | | 15745na | | |
| 1500 | 1600 | | USA, WHRA Greenbush ME | 17650na | |
| 1500 | 1600 | | USA, WHRI Noblesville IN | 13760am | 15105am |
| 1500 | 1600 | | USA, WINB Red Lion PA | 13570am | |
| 1500 | 1600 | | USA, WJIE Louisville KY | 7490am | 13595am |
| 1500 | 1600 | | USA, WRMI Miami FL | 7385am | 15725am |
| 1500 | 1600 | | USA, WTJC Newport NC | 9370na | |
| 1500 | 1600 | | USA, WWCN Nashville TN | 9475na | 12160na |
| | | | 13845na | 15825na | |
| 1500 | 1600 | | USA, WWRB Manchester TN | 9320na | 12170na |
| 1500 | 1600 | | USA, WYFR Okeechobee FL | 6280na | 11830na |
| | | | 17750na | | |
| 1500 | 1600 | | Zambia, Radio Christian Voice | 9865af | |
| 1505 | 1530 | as | Austria, Radio Austria Intl | 13755ca | |
| 1515 | 1530 | | Vatican City, Vatican Radio | 12065va | 13765va |
| | | | 15235va | | |
| 1530 | 1545 | | India, All India Radio | 9910as | |
| 1530 | 1550 | | Vatican City, Vatican Radio | 12065va | 13765va |
| | | | 15235va | | |
| 1530 | 1600 | | Georgia, Radio Georgia | 6180me | |
| 1530 | 1600 | | Iran, Voice of the Islamic Rep | 9635as | 11650as |
| 1530 | 1600 | | UAE, AWR Africa | 15225as | |
| 1530 | 1600 | | UK, BBC World Service | 6190af | 11940af |
| | | | 15400af | 17830af | 21470af |
| 1540 | 1555 | | Austria, Radio Austria Intl | 13775ca | 21660af |
| 1545 | 1600 | a | Germany, Bible Voice Broadcasting | | 15680me |
| 1555 | 1600 | as | Austria, Radio Austria Intl | 13775ca | |

1600 UTC - 12PM EDT / 11AM CDT / 9AM PDT

| | | | | | | |
|------|------|-----|-----------------------------------|----------|----------|----------|
| 1600 | 1615 | | Pakistan, Radio | 11570va | 11850va | 15100va |
| | | | 15725va | | | |
| 1600 | 1627 | | Czech Rep, Radio Prague Intl | 5930eu | 17485af | |
| 1600 | 1628 | | Vietnam, Voice of | 7220as | 9550as | 11630va |
| | | | 13740va | | | |
| 1600 | 1630 | | Guam, AWR/KSDA | 15235as | | |
| 1600 | 1630 | | Iran, Voice of the Islamic Rep | 9635as | 11650as | |
| 1600 | 1630 | | UK, BBC World Service | 6190af | 11940af | |
| | | | 15400af | 17830af | 21470af | 21660af |
| 1600 | 1635 | | UAE, Radio Dubai | 13630am | 13675eu | 15395eu |
| | | | 21605eu | | | |
| 1600 | 1659 | | Germany, Deutsche Welle | 6170as | 7225as | |
| | | | 17595as | | | |
| 1600 | 1700 | | Anguilla, Caribbean Beacon | 11775am | | |
| 1600 | 1700 | | Australia, Radio | 5995pa | 6080pa | 7220as |
| | | | 7260as 9475as | 11660as | | |
| 1600 | 1700 | | Canada, CBC Northern Service | 9625do | | |
| 1600 | 1700 | | Canada, CFRX Toronto ON | 6070do | | |
| 1600 | 1700 | | Canada, CFVP Calgary AB | 6030do | | |
| 1600 | 1700 | | Canada, CKZN St John's NF | 6160do | | |
| 1600 | 1700 | | Canada, CKZU Vancouver BC | 6160do | | |
| 1600 | 1700 | | China, China Radio Intl | 9440af | 9570af | |
| | | | 9795af 11900af | 11940af | 13640af | 17490va |
| | | | 17650va | | | |
| 1600 | 1700 | | Costa Rica, University Network | 11870am | 13750am | |
| 1600 | 1700 | | Ethiopia, Radio | 5990af | 7110af | 7165af |
| | | | 9560af 9704af | 11800af | | |
| 1600 | 1700 | | France, Radio France Intl | 6010af | 6170af | |
| | | | 9730af 11615af | 15160af | 15605af | |
| 1600 | 1700 | a | Germany, Bible Voice Broadcasting | | 15680me | |
| 1600 | 1700 | DRM | Germany, Deutsche Welle | 6140eu | | |
| 1600 | 1700 | | Germany, Overcomer Ministries | 17550na | | |
| 1600 | 1700 | a | Greece, Voice of | 7475eu | 9420eu | 15630eu |
| | | | 17705na | | | |
| 1600 | 1700 | | Jordan, Radio | 11690na | | |
| 1600 | 1700 | vl | Libya, Voice of Africa | 15660af | 17695af | |
| 1600 | 1700 | | New Zealand, Radio NZ Intl | 6095pa | | |
| 1600 | 1700 | | North Korea, Voice of | 3560me | 9975af | |
| | | | 11735af | | | |
| 1600 | 1700 | | Russia, Voice of | 5945me | 9405as | 11985af |
| | | | 11985me | 12055va | | |
| 1600 | 1700 | | South Korea, Radio Korea Intl | 5975va | 9870va | |
| 1600 | 1700 | | Taiwan, Radio Taiwan Intl | 11550as | | |
| 1600 | 1700 | | UK, BBC World Service | 3915as | 5975as | |
| | | | 6195as 7160as | 9410va | 12095va | 15190ca |
| | | | 15310as | 15485eu | 15565me | 17790as |
| 1600 | 1700 | | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | | 12133usb | 12579usb | 13362usb | 13855usb |
| 1600 | 1700 | | USA, KTBN Salt Lake City UT | 15590na | | |

Shortwave Guide



| | | | | |
|------|------|------------------------------------|---------|---------|
| 1600 | 1700 | USA, KVOH Rancho Simi CA | 17775as | |
| 1600 | 1700 | USA, KWHR Naalehu HI | 9930as | |
| 1600 | 1700 | USA, Voice of America | 6160va | 7125va |
| | | 9700va | 9760va | |
| | | 13600af | 15205af | |
| | | 15410af | 15580af | |
| 1600 | 1700 | USA, WBCQ Kennebunk ME | 9330na | 17495na |
| 1600 | 1700 | USA, WBOH Newport NC | 5920am | |
| 1600 | 1700 | USA, WEWN Birmingham AL | 11530va | 13615va |
| | | 15745va | | |
| 1600 | 1700 | USA, WHRA Greenbush ME | 17650na | |
| 1600 | 1700 | USA, WHRI Noblesville IN | 13760am | 15105am |
| 1600 | 1700 | USA, WINB Red Lion PA | 13570am | |
| 1600 | 1700 | USA, WJIE Louisville KY | 7490am | 13595am |
| 1600 | 1700 | USA, WMLK Bethel PA | 9465eu | 15265af |
| 1600 | 1700 | USA, WRMI Miami FL | 9955am | 15725am |
| 1600 | 1700 | USA, WTJC Newport NC | 9370na | |
| 1600 | 1700 | USA, WWCR Nashville TN | 9475na | 12160na |
| | | 13845na | 15825na | |
| 1600 | 1700 | USA, WWRB Manchester TN | 9320na | 12170na |
| 1600 | 1700 | USA, WYFR Okeechobee FL | 6085as | 6280na |
| | | 11830na | 11865na | 15130eu |
| | | 18980eu | 21455va | 21525va |
| | | Zambia, Radio Christian Voice | 4965af | |
| | | Vatican City, Vatican Radio | 15595va | |
| 1600 | 1700 | Egypt, Radio Cairo | 9855af | |
| 1630 | 1700 | Guam, AWR/KSDA | 11975as | 15235as |
| 1630 | 1700 | UK, BBC World Service | 6190af | 11940af |
| | | 15400af | 15420af | 17830af |
| | | 21660af | | 21470af |
| 1630 | 1700 | as UK, BBC World Service | 11860af | 21490af |
| 1640 | 1650 | mtwhfa Turkmenistan, Turkmen Radio | 4930as | |
| 1645 | 1700 | Tajikistan, Radio | 7245irr | |

1700 UTC - 1PM EDT / 12PM CDT / 10AM PDT

| | | | | | |
|------|------|-------------------------------------|----------|----------|----------|
| 1700 | 1715 | Israel, Kol Israel | 9435na | 15640na | 17535va |
| 1700 | 1727 | Czech Rep, Radio Prague Intl | 5930eu | | 17485af |
| 1700 | 1728 | Vietnam, Voice of | 9725au | | |
| 1700 | 1730 | France, Radio France Intl | 15605af | 17605af | |
| 1700 | 1745 | UK, BBC World Service | 3255af | 6005af | |
| | | 6190af 9630af | 15400af | 15420af | 17830af |
| | | 21470af | | | |
| 1700 | 1759 | Poland, Radio Polonia | 7265eu | 7285eu | |
| 1700 | 1800 | Anguilla, Caribbean Beacon | 11775am | | |
| 1700 | 1800 | Australia, Radio | 5995pa | 6080pa | 7220as |
| | | 7260as 9475as | 11880as | | |
| 1700 | 1800 | Canada, CBC Northern Service | 9625do | | |
| 1700 | 1800 | Canada, CFRX Toronto ON | 6070do | | |
| 1700 | 1800 | Canada, CFVP Calgary AB | 6030do | | |
| 1700 | 1800 | Canada, CKZN St John's NF | 6160do | | |
| 1700 | 1800 | Canada, CKZU Vancouver BC | 6160do | | |
| 1700 | 1800 | China, China Radio Intl | 9570af | 11670va | |
| | | 11900af | 11940af | 13640af | 15150af |
| | | Costa Rica, University Network | 11870am | 13750am | |
| 1700 | 1800 | Egypt, Radio Cairo | 9855af | | |
| 1700 | 1800 | Eqt Guinea, Radio Africa | 7189af | 15184al | |
| 1700 | 1800 | a Germany, Bible Voice Broadcasting | | 15680me | |
| 1700 | 1800 | DRM Germany, Deutsche Welle | 6140eu | | |
| 1700 | 1800 | Germany, Overcomer Ministries | 17550na | | |
| 1700 | 1800 | Japan, Radio | 9535am | 11970eu | 15355af |
| 1700 | 1800 | Libya, Voice of Africa | 15660af | 17635af | |
| | | 17695af | 17880af | | |
| 1700 | 1800 | New Zealand, Radio NZ Intl | 6095pa | | |
| 1700 | 1800 | Russia, Voice of | 9405as | 9890eu | 11510af |
| | | 11675af | 11985af | | |
| 1700 | 1800 | DRM/as Russia, Voice of | 11675eu | | |
| 1700 | 1800 | South Africa, Channel Africa | 15245af | | |
| 1700 | 1800 | DRM Sweden, Radio | 5955eu | | |
| 1700 | 1800 | Taiwan, Radio Taiwan Intl | 11550as | | |
| 1700 | 1800 | UK, BBC World Service | 3915as | 5975as | |
| | | 6195as 7160as | 9410eu | 9510as | 12095va |
| | | 15310as | 15485eu | 15565me | |
| 1700 | 1800 | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | 12133usb | 12579usb | 13362usb | 13855usb |
| 1700 | 1800 | USA, KTBN Salt Lake City UT | 15590na | | |
| 1700 | 1800 | USA, KVOH Rancho Simi CA | 17775as | | |
| 1700 | 1800 | USA, KWHR Naalehu HI | 9930as | | |
| 1700 | 1800 | USA, Voice of America | 6020va | 6160va | |
| | | 7125va | 9640va | 9700va | 9760va |
| | | 9850af 15255va | 15410af | 15580af | |
| 1700 | 1800 | USA, WBCQ Kennebunk ME | 9330na | 17495na | |
| 1700 | 1800 | USA, WBOH Newport NC | 5920am | | |
| 1700 | 1800 | USA, WEWN Birmingham AL | 11530va | 13615va | |
| | | 15685va | 15745va | | |
| 1700 | 1800 | USA, WHRA Greenbush ME | 17650na | | |
| 1700 | 1800 | USA, WHRI Noblesville IN | 13670am | 15665am | |
| 1700 | 1800 | USA, WINB Red Lion PA | 13570am | | |
| 1700 | 1800 | USA, WJIE Louisville KY | 7490am | 13595am | |

| | | | | |
|------|------|------------------------------------|---------|---------|
| 1700 | 1800 | USA, WMLK Bethel PA | 9465eu | 15265af |
| 1700 | 1800 | USA, WRMI Miami FL | 9955am | 15725am |
| 1700 | 1800 | USA, WTJC Newport NC | 9370na | |
| 1700 | 1800 | USA, WWCR Nashville TN | 9475na | 12160na |
| | | 13845na | 15825na | |
| 1700 | 1800 | USA, WWRB Manchester TN | 9320na | 12170na |
| 1700 | 1800 | USA, WYFR Okeechobee FL | 17795eu | 18980eu |
| | | 21455eu | | |
| 1700 | 1800 | Zambia, Radio Christian Voice | 4965af | |
| 1715 | 1730 | Vatican City, Vatican Radio | 4005va | 5890va |
| | | 7250va | 9645va | 15595va |
| 1730 | 1745 | mtwhf UK, United Nations Radio | 7170af | 15495me |
| | | 17810af | | |
| 1730 | 1800 | Belgium, Radio Vlaanderen Intl | 9925eu | 11640eu |
| 1730 | 1800 | Bulgaria, Radio | 9500eu | 11500eu |
| 1730 | 1800 | Georgia, Radio Georgia | 11910eu | |
| 1730 | 1800 | Guam, AWR/KSDA | 9385me | |
| 1730 | 1800 | Liberia, ELWA | 4760do | |
| 1730 | 1800 | Philippines, Radio Pilipinas | 11720me | 15190me |
| | | 17720me | | |
| 1730 | 1800 | Swaziland, TWR | 3200af | 9500af |
| 1730 | 1800 | Sweden, Radio | 6065eu | |
| 1730 | 1800 | USA, Voice of America | 11975af | 17895af |
| 1730 | 1800 | Vatican City, Vatican Radio | 13765af | 15570af |
| | | 17515af | | |
| 1735 | 1745 | vt/th Paraguay, Radio Nacional | 9739sa | |
| 1745 | 1755 | mtwhfa Turkmenistan, Turkmen Radio | 4930as | |
| 1745 | 1800 | Bangladesh, Bangla Betar | 7185me | 9550me |
| 1745 | 1800 | India, All India Radio | 7410eu | 9445af |
| | | 9950eu | 11620eu | 11935af |
| | | 15075af | 15155af | 17670af |
| 1745 | 1800 | UK, BBC World Service | 3255af | 6190af |
| | | 15400af | 15420af | 17830af |

1800 UTC - 2PM EDT / 1PM CDT / 11AM PDT

| | | | | |
|------|------|-------------------------------------|----------|----------|
| 1800 | 1810 | Zanzibar, Voice of Tanzania | 11734do | |
| 1800 | 1828 | Vietnam, Voice of | 11630va | 13740va |
| 1800 | 1830 | Egypt, Radio Cairo | 9855af | |
| 1800 | 1830 | a Germany, Bible Voice Broadcasting | | 15680me |
| 1800 | 1830 | s Germany, Universal Life | 15675af | |
| 1800 | 1830 | South Africa, AWR Africa | 3215af | 3345af |
| | | 12130af | | |
| 1800 | 1830 | UK, BBC World Service | 3255af | 5975as |
| | | 6190af 6195eu | 9410eu | 9510as |
| | | 15310me | 15400af | 15420af |
| | | 21470af | | |
| 1800 | 1850 | New Zealand, Radio NZ Intl | 6095pa | |
| 1800 | 1856 | Romania, Radio Romania Intl | 11940eu | 15380eu |
| 1800 | 1859 | Canada, Radio Canada Intl | 9530af | 11770af |
| | | 13730af | 15255as | |
| 1800 | 1900 | Anguilla, Caribbean Beacon | 11775am | |
| 1800 | 1900 | mtwhf Argentina, RAE | 9690eu | 15345eu |
| 1800 | 1900 | Australia, Radio | 6080pa | 7220as |
| | | 7260as 9475as | 11880as | |
| 1800 | 1900 | Australia, Voice Intl | 6115as | |
| 1800 | 1900 | Canada, CBC Northern Service | 9625do | |
| 1800 | 1900 | Canada, CFRX Toronto ON | 6070do | |
| 1800 | 1900 | Canada, CFVP Calgary AB | 6030do | |
| 1800 | 1900 | Canada, CKZN St John's NF | 6160do | |
| 1800 | 1900 | Canada, CKZU Vancouver BC | 6160do | |
| 1800 | 1900 | China, China Radio Intl | 11670va | 11940va |
| | | 13640va | 13760va | 15150af |
| 1800 | 1900 | Costa Rica, University Network | 11870am | 13750am |
| 1800 | 1900 | Eqt Guinea, Radio Africa | 7189af | 15184al |
| 1800 | 1900 | Germany, Overcomer Ministries | 17550na | |
| 1800 | 1900 | India, All India Radio | 7410eu | 9445af |
| | | 9950eu | 11620eu | 11935af |
| | | 15075af | 15155af | 17670af |
| 1800 | 1900 | Latvia, Laser Radio | 9290eu | |
| 1800 | 1900 | Liberia, ELWA | 4760do | |
| 1800 | 1900 | vi Libya, Voice of Africa | 15205af | 15660af |
| | | 17635af | 17695af | |
| 1800 | 1900 | Netherlands, Radio | 6020af | 9895af |
| 1800 | 1900 | vi Philippines, Radio Pilipinas | 11720me | 11655af |
| | | 17720me | | 15190me |
| 1800 | 1900 | Russia, Voice of | 9480af | 9745eu |
| | | 11510eu | | 9820eu |
| 1800 | 1900 | Sierra Leone, Radio UNAMSIL | 6139af | |
| 1800 | 1900 | Swaziland, TWR | 3200af | 9500af |
| 1800 | 1900 | Taiwan, Radio Taiwan Intl | 3965eu | |
| 1800 | 1900 | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | 5765usb | 6350usb | 7507usb |
| | | 12133usb | 12579usb | 13362usb |
| 1800 | 1900 | USA, KJES Vado NM | 15385na | |
| 1800 | 1900 | USA, KTBN Salt Lake City UT | 15590na | |
| 1800 | 1900 | USA, KVOH Rancho Simi CA | 17775as | |
| 1800 | 1900 | USA, Voice of America | 6040va | 9760va |
| | | 9770va | 9850af | 11975af |
| | | 15580af | 17895af | 15410af |

Shortwave Guide



| | | | | |
|------|------|---------------------------------|---------|---------|
| 1800 | 1900 | USA, WBCQ Kennebunk ME | 9330na | 17495na |
| 1800 | 1900 | USA, WBOH Newport NC | 5920am | |
| 1800 | 1900 | USA, WEWN Birmingham AL | 11530va | 13615va |
| | | 15685va | 15745va | |
| 1800 | 1900 | USA, WHRA Greenbush ME | 17650na | |
| 1800 | 1900 | USA, WHRI Noblesville IN | 13760am | 15665am |
| 1800 | 1900 | USA, WINB Red Lion PA | 13570am | |
| 1800 | 1900 | USA, WJIE Louisville KY | 7490am | 13595am |
| 1800 | 1900 | USA, WMLK Bethel PA | 9465eu | 15265al |
| 1800 | 1900 | USA, WRMI Miami FL | 9955am | 15725am |
| 1800 | 1900 | USA, WTJC Newport NC | 9370na | |
| 1800 | 1900 | USA, WWCR Nashville TN | 9475na | 12160na |
| | | 13845na | 15825na | |
| 1800 | 1900 | USA, WWRB Manchester TN | 9320na | 12170na |
| 1800 | 1900 | USA, WYFR Okeechobee FL | 13700eu | 17795eu |
| | | 18980eu | | |
| 1800 | 1900 | Yemen, Rep of Yemen Radio | 9780me | |
| 1800 | 1900 | Zambia, Radio Christian Voice | 4965af | |
| 1815 | 1900 | Bangladesh, Bangla Betar | 7185eu | 9550eu |
| | | 15520eu | | |
| 1830 | 1845 | Germany, IBRA Radio | 9520af | |
| 1830 | 1855 | Greece, Voice of | 12105eu | |
| 1830 | 1900 | Georgia, Radio Georgia | 11760eu | |
| 1830 | 1900 | Serbia & Montenegro, Intl Radio | 6100eu | |
| 1830 | 1900 | South Africa, AWR Africa | 12130af | |
| 1830 | 1900 | Turkey, Voice of | 9785eu | |
| 1830 | 1900 | UK, BBC World Service | 3255af | 6055af |
| | | 6190af 9630af | 15400af | 17820af |
| | | 21470af | | |
| 1845 | 1900 | Albania, Radio Tirana Intl | 7210eu | 9520eu |
| 1845 | 1900 | Congo, RTV Congolaise | 4765af | 5985af |
| 1851 | 1900 | New Zealand, Radio NZ Intl | 9845pa | |

1900 UTC - 3PM EDT / 2PM CDT / 12PM PDT

| | | | | |
|------|------|--------------------------------|---------|---------|
| 1900 | 1915 | Congo, RTV Congolaise | 4765af | 5985af |
| 1900 | 1920 | Turkey, Voice of | 9785eu | |
| 1900 | 1925 | Israel, Kol Israel | 15615eu | 17535eu |
| 1900 | 1928 | Vietnam, Voice of | 11630va | 13740va |
| 1900 | 1930 | Germany, Universal Life | 13820me | |
| 1900 | 1930 | Hungary, Radio Budapest | 3975eu | 6025eu |
| | | 11720eu | | |
| 1900 | 1930 | Philippines, Radio Pilipinas | 11720me | 15190me |
| | | 17720me | | |
| 1900 | 1945 | India, All India Radio | 7410eu | 9445af |
| | | 9950eu | 11620eu | 13605af |
| | | 15075af | 15155af | 17670af |
| 1900 | 1950 | New Zealand, Radio NZ Intl | 9845pa | |
| 1900 | 1959 | Germany, Deutsche Welle | 13590af | 15545af |
| | | 17770af | | |
| 1900 | 2000 | Anguilla, Caribbean Beacon | 11775am | |
| 1900 | 2000 | Australia, Radio | 6080pa | 7220as |
| | | 9500as 11650as | 11880as | 7240va |
| 1900 | 2000 | Australia, Voice Intl | 6115as | |
| 1900 | 2000 | Canada, CBC Northern Service | 9625do | |
| 1900 | 2000 | Canada, CFRX Toronto ON | 6070do | |
| 1900 | 2000 | Canada, CFVP Calgary AB | 6030do | |
| 1900 | 2000 | Canada, CKZN St John's NF | 6160do | |
| 1900 | 2000 | Canada, CKZU Vancouver BC | 6160do | |
| 1900 | 2000 | Canada, Radio Canada Intl | 17765am | |
| 1900 | 2000 | China, China Radio Intl | 7145af | 9430af |
| | | 9585af 11940af | 13760va | |
| 1900 | 2000 | Costa Rica, University Network | 11870am | 13750am |
| 1900 | 2000 | Eqt Guinea, Radio Africa | 7189af | 15184al |
| 1900 | 2000 | Ghana, Ghana BC Corp | 3366do | 4915do |
| 1900 | 2000 | Italy, IRRS | 5755va | |
| 1900 | 2000 | Latvia, Laser Radio | 9290eu | |
| 1900 | 2000 | Liberia, ELWA | 4760do | |
| 1900 | 2000 | Libya, Voice of Africa | 15205af | 15315af |
| 1900 | 2000 | Malaysia, Radio Malaysia | 7295do | |
| 1900 | 2000 | Namibia, Namibian BC Corp | 3270af | 3290af |
| | | 6060af | | |
| 1900 | 2000 | Netherlands, Radio | 7120af | 9895af |
| | | 17810af | 11655af | |
| 1900 | 2000 | Netherlands, Radio | 15315na | 17660na |
| 1900 | 2000 | Nigeria, Radio/Enugu | 6025do | 17735na |
| 1900 | 2000 | Nigeria, Radio/Ibadan | 6050do | |
| 1900 | 2000 | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 1900 | 2000 | Nigeria, Radio/Lagos | 3326do | 4990do |
| 1900 | 2000 | Nigeria, Voice of | 15120af | 17800af |
| 1900 | 2000 | North Korea, Voice of | 4405eu | 13760eu |
| | | 15245eu | | |
| 1900 | 2000 | Russia, Voice of | 7310eu | 7440eu |
| 1900 | 2000 | Sierra Leone, Radio UNAMSIL | 6139af | 9890eu |
| 1900 | 2000 | Sierra Leone, SLBS | 3316do | |
| 1900 | 2000 | Solomon Islands, SIBC | 5020do | 9545do |
| 1900 | 2000 | South Africa, Channel Africa | 3345af | |
| 1900 | 2000 | South Korea, Radio Korea Intl | 5975va | 7275eu |
| 1900 | 2000 | Sri Lanka, SLBC | 6010eu | |

| | | | | |
|------|------|--------------------------------|----------|----------|
| 1900 | 2000 | Swaziland, TWR | 3200af | |
| 1900 | 2000 | Thailand, Radio | 7155eu | |
| 1900 | 2000 | Uganda, Radio | 4976do | 5026do |
| 1900 | 2000 | UK, BBC World Service | 3255af | 6005af |
| | | 6190af 6195eu | 9410eu | 9630af |
| | | 15310me | 15400af | 12095af |
| | | 17830af | | |
| 1900 | 2000 | USA, Armed Forces Radio | 4319usb | 5446usb |
| | | 5765usb | 6350usb | 7507usb |
| | | 12133usb | 12579usb | 10320usb |
| | | 13815va | | 13855usb |
| 1900 | 2000 | USA, KAJJ Dallas TX | 13815va | |
| 1900 | 2000 | USA, KJES Vado NM | | 15385na |
| 1900 | 2000 | USA, KTBN Salt Lake City UT | | 15590na |
| 1900 | 2000 | USA, KVOH Rancho Simi CA | | 17775as |
| 1900 | 2000 | USA, Voice of America | 4950af | 6040va |
| | | 9760va | 9770af | 9850af |
| | | 13670af | 15410va | 11975af |
| | | 17895af | | 15580af |
| 1900 | 2000 | USA, Voice of America | 5965va | 9840va |
| | | 11720va | 11970va | 13725va |
| 1900 | 2000 | USA, WBCQ Kennebunk ME | 7415na | 9330na |
| | | 17495na | | |
| 1900 | 2000 | USA, WBOH Newport NC | 5920am | |
| 1900 | 2000 | USA, WEWN Birmingham AL | 11530va | 13615va |
| | | 15685va | 15745va | |
| 1900 | 2000 | USA, WHRA Greenbush ME | 17650na | |
| 1900 | 2000 | USA, WHRI Noblesville IN | 13760am | 15665am |
| 1900 | 2000 | USA, WINB Red Lion PA | 13570am | |
| 1900 | 2000 | USA, WJIE Louisville KY | 7490am | 13595am |
| 1900 | 2000 | USA, WMLK Bethel PA | 9465eu | 15265al |
| 1900 | 2000 | USA, WTJC Newport NC | 9370na | |
| 1900 | 2000 | USA, WWCR Nashville TN | 9475na | 12160na |
| | | 13845na | 15825na | |
| 1900 | 2000 | USA, WYFR Okeechobee FL | 6085af | 15130eu |
| | | 17750eu | 17795eu | 17845va |
| 1900 | 2000 | Vanuatu, Radio | 4960do | 7260do |
| 1900 | 2000 | Zambia, Radio Christian Voice | 4965af | |
| 1915 | 1925 | Zimbabwe, ZBC Corp | 5975do | |
| 1930 | 2000 | Rwanda, Radio | 6005do | |
| 1930 | 2000 | Belarus, Radio Belarus Intl | 7105eu | 7210eu |
| 1930 | 2000 | Belgium, Radio Vlaanderen Intl | 9925eu | |
| 1930 | 2000 | Germany, AWR | 15175eu | |
| 1930 | 2000 | Iran, Voice of the Islamic Rep | 9800af | 11750eu |
| 1930 | 2000 | Papua New Guinea, NBC | 4890do | 9675irr |
| 1930 | 2000 | Sweden, Radio | 6065va | |
| 1930 | 2000 | USA, Voice of America | 7260me | 9680me |
| | | 13635me | | |
| 1935 | 1955 | Italy, RAI Intl | 5970eu | 9605eu |
| 1951 | 2000 | New Zealand, Radio NZ Intl | 11725pa | |

2000 UTC - 4PM EDT / 3PM CDT / 1PM PDT

| | | | | |
|------|------|---------------------------------|---------|---------|
| 2000 | 2027 | Czech Rep, Radio Prague Intl | 5930eu | 11600va |
| 2000 | 2030 | Germany, Universal Life | 5775va | |
| 2000 | 2030 | Iran, Voice of the Islamic Rep | 9800af | 11750eu |
| 2000 | 2030 | Italy, IRRS | 5775va | |
| 2000 | 2030 | Libya, Voice of Africa | 11635af | 15315af |
| 2000 | 2030 | Mongolia, Voice of | 12015eu | |
| 2000 | 2030 | USA, Voice of America | 4950af | 6040va |
| | | 6095va | 9760va | 9770va |
| | | 11855af | 11975af | 13670af |
| | | 15445af | 17745af | 15410af |
| 2000 | 2030 | Vatican City, Vatican Radio | 9660eu | 11625eu |
| | | 13765eu | | |
| 2000 | 2030 | Vietnam, Voice of | 7220as | 9550as |
| 2000 | 2045 | Swaziland, TWR | 3200af | |
| 2000 | 2050 | New Zealand, Radio NZ Intl | 11725pa | |
| 2000 | 2059 | Canada, Radio Canada Intl | 5850eu | 7235eu |
| | | 11690af | 13700eu | 17870eu |
| 2000 | 2059 | Germany, Deutsche Welle | 7130af | 13820af |
| | | 15205af | | |
| 2000 | 2059 | Spain, Radio Exterior Espana | 9570va | 15290va |
| 2000 | 2100 | Anguilla, Caribbean Beacon | 11775am | |
| 2000 | 2100 | Australia, ABC NT Alice Springs | 2310do | 4835irr |
| 2000 | 2100 | Australia, ABC NT Katherine | 2485do | |
| 2000 | 2100 | Australia, ABC NT Tennant Creek | 2325do | |
| 2000 | 2100 | Australia, Radio | 6080pa | 9500as |
| | | 11650as | 11880as | |
| 2000 | 2100 | Australia, Voice Intl | 6115as | |
| 2000 | 2100 | Canada, CBC Northern Service | 9625do | |
| 2000 | 2100 | Canada, CFRX Toronto ON | 6070do | |
| 2000 | 2100 | Canada, CFVP Calgary AB | 6030do | |
| 2000 | 2100 | Canada, CKZN St John's NF | 6160do | |
| 2000 | 2100 | Canada, CKZU Vancouver BC | 6160do | |
| 2000 | 2100 | Canada, Radio Canada Intl | 17765am | |
| 2000 | 2100 | China, China Radio Intl | 7190eu | 9430eu |
| | | 9600eu | 11640va | 11940af |
| | | 13760af | | 13630af |
| 2000 | 2100 | Costa Rica, University Network | 13750am | |
| 2000 | 2100 | Eqt Guinea, Radio Africa | 7189af | 15184al |

Shortwave Guide

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| | | | | | | | | | | | |
|------|------|--------|---------------------------------|----------|----------|------|------|--------|---------------------------------|----------|----------|
| 2000 | 2100 | vi | Ghana, Ghana BC Corp | 3366do | 4915do | 2100 | 2130 | | South Korea, Radio Korea Intl | 3955eu | |
| 2000 | 2100 | | Indonesia, Voice of | 9525as | 15150al | 2100 | 2130 | DRM | Vatican City, Vatican Radio | 9800eu | |
| 2000 | 2100 | | Latvia, Laser Radio | 9290eu | | 2100 | 2159 | DRM | Canada, Radio Canada Intl | 9800na | |
| 2000 | 2100 | | Liberia, ELWA | 4760do | | 2100 | 2159 | | Germany, Deutsche Welle | 9440af | 11865af |
| 2000 | 2100 | | Malaysia, Radio Malaysia | 7295do | | | | | 15205af | | |
| 2000 | 2100 | | Namibia, Namibian BC Corp | 3270af | 3290af | 2100 | 2159 | as | Spain, Radio Exterior Espana | 9570eu | 9640eu |
| | | | 6060af | | | 2100 | 2200 | | Anguilla, Caribbean Beacon | 11775am | |
| 2000 | 2100 | | Netherlands, Radio | 7120af | 9895af | 2100 | 2200 | | Australia, ABC NT Alice Springs | 2310do | 4835irr |
| | | | 17810af | | 11655af | 2100 | 2200 | | Austria, AWR Europe | 15130af | |
| 2000 | 2100 | as | Netherlands, Radio | 15315na | 17660na | 2100 | 2200 | | Bulgaria, Radio | 5800eu | 7500eu |
| 2000 | 2100 | | Nigeria, Radio/Enugu | 6025do | | 2100 | 2200 | | Canada, CBC Northern Service | 9625do | |
| 2000 | 2100 | | Nigeria, Radio/Ibadan | 6050do | | 2100 | 2200 | | Canada, CFRX Toronto ON | 6070do | |
| 2000 | 2100 | | Nigeria, Radio/Kaduna | 4770do | 6090do | 2100 | 2200 | | Canada, CFVP Calgary AB | 6030do | |
| 2000 | 2100 | | Nigeria, Radio/Lagos | 3326do | 4990do | 2100 | 2200 | | Canada, CKZN St John's NF | 6160do | |
| 2000 | 2100 | | Nigeria, Voice of | 7255af | 15120af | 2100 | 2200 | | Canada, CKZU Vancouver BC | 6160do | |
| 2000 | 2100 | | Papua New Guinea, NBC | 4890do | 9675irr | 2100 | 2200 | | Canada, Radio Canada Intl | 17765am | |
| 2000 | 2100 | | Russia, Voice of | 7310eu | 11980eu | 2100 | 2200 | | Costa Rica, University Network | 13750am | |
| 2000 | 2100 | | Sierra Leone, Radio UNAMSIL | 6139af | | 2100 | 2200 | | Egypt, Radio Cairo | 15375af | |
| 2000 | 2100 | | Sierra Leone, SLBS | 3316do | | 2100 | 2200 | | Eqt Guinea, Radio Africa | 7189af | 15184al |
| 2000 | 2100 | vi | Solomon Islands, SIBC | 5020do | 9545do | 2100 | 2200 | vi | Ghana, Ghana BC Corp | 3366do | 4915do |
| 2000 | 2100 | | South Africa, AWR Africa | 7170af | | 2100 | 2200 | | Guyana, Voice of | 3290do | |
| 2000 | 2100 | | Uganda, Radio | 4976do | 5026do | 2100 | 2200 | | India, All India Radio | 7410eu | 9445eu |
| 2000 | 2100 | | UK, BBC World Service | 3255af | 6005af | | | | 9910au | 9950au | 11620eu |
| | | | 6190af 6195eu | 9410eu | 9630af | 2100 | 2200 | | Japan, Radio | 6035pa | 6055eu |
| | | | 15400af | 17830af | | | | | 11855af | 17825pa | 21670pa |
| 2000 | 2100 | | USA, Armed Forces Radio | 4319usb | 5446usb | 2100 | 2200 | | Latvia, Laser Radio | 9290eu | |
| | | | 5765usb | 6350usb | 7507usb | 2100 | 2200 | | Liberia, ELWA | 4760do | |
| | | | 12133usb | 12579usb | 13855usb | 2100 | 2200 | | Malaysia, Radio Malaysia | 7295do | |
| 2000 | 2100 | | USA, KAIJ Dallas TX | 13815va | | 2100 | 2200 | | Namibia, Namibian BC Corp | 3270af | 3290af |
| 2000 | 2100 | | USA, KTVN Salt Lake City UT | | 15590na | | | | 6060af | | |
| 2000 | 2100 | | USA, KVOH Rancho Simi CA | | 17775as | 2100 | 2200 | DRM | Netherlands, Radio | 15150eu | |
| 2000 | 2100 | | USA, KWHR Naalehu HI | | 11565as | 2100 | 2200 | | New Zealand, Radio NZ Intl | 15720pa | |
| 2000 | 2100 | | USA, WBCQ Kennebunk ME | 7415na | 9330na | 2100 | 2200 | | Nigeria, Radio/Enugu | 6025do | |
| | | | 17495na | | | 2100 | 2200 | | Nigeria, Radio/Ibadan | 6050do | |
| 2000 | 2100 | | USA, WBOH Newport NC | 5920am | | 2100 | 2200 | | Nigeria, Radio/Kaduna | 4770do | 6090do |
| 2000 | 2100 | | USA, WEWN Birmingham AL | 15745va | 17595va | 2100 | 2200 | | Nigeria, Radio/Lagos | 3326do | 4990do |
| | | | | | | 2100 | 2200 | | Nigeria, Voice of | 7255af | 15120af |
| 2000 | 2100 | | USA, WHRA Greenbush ME | 17650na | | 2100 | 2200 | | North Korea, Voice of | 4405eu | 13760eu |
| 2000 | 2100 | | USA, WHRI Noblesville IN | 13760am | 15665am | | | | 15245eu | | |
| 2000 | 2100 | | USA, WINB Red Lion PA | 13570am | | 2100 | 2200 | | Papua New Guinea, NBC | 4890do | 9675irr |
| 2000 | 2100 | | USA, WJIE Louisville KY | 7490am | 13595am | 2100 | 2200 | | Sierra Leone, Radio UNAMSIL | 6139af | |
| 2000 | 2100 | | USA, WMLK Bethel PA | 9465eu | 15265al | 2100 | 2200 | | Sierra Leone, SLBS | 3316do | |
| 2000 | 2100 | | USA, WRMI Miami FL | 9955am | 15725am | 2100 | 2200 | | Syria, Radio Damascus | 12085eu | 13610eu |
| 2000 | 2100 | | USA, WTJC Newport NC | 9370na | | 2100 | 2200 | | UK, BBC World Service | 3255af | 5965as |
| 2000 | 2100 | | USA, WWCN Nashville TN | 9475na | 12160na | | | | 5975ca | 6005af | 6110as |
| | | | 13845na | 15825na | | | | | 6195va | 9410eu | 12095ca |
| 2000 | 2100 | | USA, WWRB Manchester TN | 9320na | 12170na | | | | 17830af | | |
| 2000 | 2100 | | USA, WYFR Okeechobee FL | 17755a | 17750eu | 2100 | 2200 | | Ukraine, Radio Ukraine Intl | 7420eu | |
| | | | 17795eu | 17845eu | | 2100 | 2200 | | USA, Armed Forces Radio | 4319usb | 5446usb |
| 2000 | 2100 | vi | Vanuatu, Radio | 4960do | 7260do | | | | 5765usb | 6350usb | 7507usb |
| 2000 | 2100 | | Zambia, Radio Christian Voice | 4965af | | | | | 12133usb | 12579usb | 13362usb |
| 2000 | 2100 | vi | Zimbabwe, ZBC Corp | 5975do | | 2100 | 2200 | | USA, KAIJ Dallas TX | 13815va | |
| 2005 | 2100 | | Syria, Radio Damascus | 12085eu | 13610eu | 2100 | 2200 | | USA, KTVN Salt Lake City UT | 15590na | |
| 2025 | 2045 | | Italy, RAI Intl | 6185af | 9570af | 2100 | 2200 | | USA, KVOH Rancho Simi CA | 17775as | |
| 2030 | 2045 | | Thailand, Radio | 9680eu | | 2100 | 2200 | | USA, KWHR Naalehu HI | 11565as | |
| 2030 | 2058 | | Vietnam, Voice of | 9725va | 11630va | 2100 | 2200 | | USA, Voice of America | 11975af | 13670af |
| | | | 13740va | | | | | | 15410af | 15445af | |
| 2030 | 2100 | t h | Belarus, Radio Belarus Intl | 7105eu | 7210eu | 2100 | 2200 | | USA, WBCQ Kennebunk ME | 5105na | 7415na |
| 2030 | 2100 | | Cuba, Radio Havana | 9505ca | 11760na | | | | 9330na | 17495na | |
| 2030 | 2100 | | Egypt, Radio Cairo | 15375af | | 2100 | 2200 | | USA, WBOH Newport NC | 5920am | |
| 2030 | 2100 | vi | Libya, Voice of Africa | 11635af | | 2100 | 2200 | | USA, WEWN Birmingham AL | 11530va | 13615va |
| 2030 | 2100 | DRM | Netherlands, Radio | 9800na | | | | | 15745va | 17595va | |
| 2030 | 2100 | | Turkey, Voice of | 7170as | | 2100 | 2200 | | USA, WHRA Greenbush ME | 17650na | |
| 2030 | 2100 | f | UK, Wales Radio Intl | 7150eu | 7325eu | 2100 | 2200 | | USA, WHRI Noblesville IN | 13770am | 15665am |
| 2030 | 2100 | as | USA, Voice of America | 4950af | 9850af | 2100 | 2200 | | USA, WINB Red Lion PA | 13570am | |
| | | | 11975af | 13670af | 15410af | 2100 | 2200 | | USA, WJIE Louisville KY | 7490am | 13595am |
| | | | 17745af | | | 2100 | 2200 | | USA, WMLK Bethel PA | 9465eu | 15265al |
| 2030 | 2100 | | Uzbekistan, Radio Tashkent Intl | 5025eu | 9545eu | 2100 | 2200 | | USA, WRMI Miami FL | 9955am | 15725am |
| | | | 11905eu | | | 2100 | 2200 | | USA, WTJC Newport NC | 9370na | |
| 2040 | 2100 | mtwhfa | Armenia, Voice of | 4810eu | 9960eu | 2100 | 2200 | | USA, WWCN Nashville TN | 9475na | 12160na |
| 2040 | 2100 | | Vatican City, Vatican Radio | 6185eu | | | | | 13845na | 15825na | |
| 2045 | 2100 | | India, All India Radio | 7410eu | 9445eu | 2100 | 2200 | | USA, WWRB Manchester TN | 9320na | 12170na |
| | | | 9910au | 9950au | 11620eu | 2100 | 2200 | | USA, WYFR Okeechobee FL | 17575sa | 17795eu |
| 2050 | 2100 | | Vatican City, Vatican Radio | 4005eu | 5890eu | | | | 17845sa | 18930eu | 18980va |
| | | | 5890eu | 7250eu | | 2100 | 2200 | vi | Vanuatu, Radio | 4960do | 7260do |
| 2051 | 2100 | | New Zealand, Radio NZ Intl | 15720pa | | 2100 | 2200 | vi | Zambia, Radio Christian Voice | 4965af | |
| 2055 | 2100 | DRM | Vatican City, Vatican Radio | 9800eu | | 2100 | 2200 | | Zimbabwe, ZBC Corp | 5975do | |
| | | | | | | 2115 | 2130 | | UK, BBC World Service | 11675ca | 15390ca |
| | | | | | | 2115 | 2200 | | Egypt, Radio Cairo | 9990eu | |
| | | | | | | 2130 | 2145 | if | UK, BBC World Service | 11680ca | |
| | | | | | | 2130 | 2156 | | Romania, Radio Romania Intl | 7285eu | 9725eu |
| | | | | | | | | | 15285eu | 17735eu | |
| 2100 | 2120 | | Turkey, Voice of | 7170as | | 2130 | 2200 | mtwhfa | Albania, Radio Tirana Intl | 7130eu | 9540eu |
| 2100 | 2130 | | Australia, ABC NT Katherine | 2485do | | 2130 | 2200 | | Australia, ABC NT Katherine | 5025do | |
| 2100 | 2130 | | Australia, ABC NT Tennant Creek | 2325do | | 2130 | 2200 | | Australia, ABC NT Tennant Creek | 4910do | |
| 2100 | 2130 | | Australia, Radio | 7220as | 9500as | 2130 | 2200 | | Australia, Radio | 9660pa | 11650as |
| | | | 11650as | 11880as | 17715pa | | | | 12080va | 17715pa | 17585pa |
| 2100 | 2130 | | China, China Radio Intl | 11640af | 13630af | 2130 | 2200 | | Guam, AWR/KSDA | 11850as | 11980as |
| 2100 | 2130 | mtwhfa | Cuba, Radio Havana | 9505ca | 11760na | 2130 | 2200 | | Sweden, Radio | 6065va | 9880va |
| 2100 | 2130 | | Hungary, Radio Budapest | 6025va | 11830va | 2130 | 2200 | | Uzbekistan, Radio Tashkent Intl | 5025eu | 9545eu |
| 2100 | 2130 | | Serbia & Montenegro, Intl Radio | 6100eu | | | | | 11905eu | | |

2100 UTC - 5PM EDT / 4PM CDT / 2PM PDT

Shortwave Guide



2200 UTC - 6PM EDT / 5PM CDT / 3PM PDT

| | | | | | |
|------|------|--|----------|----------|----------|
| 2200 | 2205 | Syria, Radio Damascus | 12085eu | 13610eu | |
| 2200 | 2229 | Canada, Radio Canada Intl | 5960am | 13785am | |
| | | 15170am | | | |
| 2200 | 2229 | Germany, Deutsche Welle | 9800na | | |
| 2200 | 2230 | Belgium, Radio Vlaanderen Intl | 11635na | | |
| 2200 | 2230 | vi Croatia, Croatian Radio | 9925sa | | |
| 2200 | 2230 | India, All India Radio | 7410eu | 9445eu | |
| | | 9910au | 9950au | 11620eu | 11715au |
| 2200 | 2230 | Liberia, ELWA | 4760do | | |
| 2200 | 2230 | smtwhf Serbia & Montenegro, Intl Radio | 7230pa | | |
| 2200 | 2245 | Egypt, Radio Cairo | 9990eu | | |
| 2200 | 2250 | Turkey, Voice of | 9830va | | |
| 2200 | 2259 | Germany, Deutsche Welle | 7115as | 9720as | |
| 2200 | 2300 | Anguilla, Caribbean Beacon | 6090am | | |
| 2200 | 2300 | Australia, ABC NT Alice Springs | 2310do | 4835irr | |
| 2200 | 2300 | Australia, ABC NT Katherine | 5025do | | |
| 2200 | 2300 | Australia, ABC NT Tennant Creek | 4910do | | |
| 2200 | 2300 | Australia, Radio | 11880va | 13620pa | 15320pa |
| | | 17715pa | 17585pa | 21740as | |
| 2200 | 2300 | Canada, CBC Northern Service | 9625do | | |
| 2200 | 2300 | Canada, CFRX Toronto ON | 6070do | | |
| 2200 | 2300 | Canada, CFVP Calgary AB | 6030do | | |
| 2200 | 2300 | Canada, CKZN St John's NF | 6160do | | |
| 2200 | 2300 | Canada, CKZU Vancouver BC | 6160do | | |
| 2200 | 2300 | Canada, Radio Canada Intl | 5960am | 13785am | |
| 2200 | 2300 | China, China Radio Intl | 9880eu | | |
| 2200 | 2300 | Costa Rica, University Network | 13750am | | |
| 2200 | 2300 | Eat Guinea, Radio Africa | 7189af | 15184al | |
| 2200 | 2300 | vi Ghana, Ghana BC Corp | 3366do | 4915do | |
| 2200 | 2300 | Guyana, Voice of | 3290do | | |
| 2200 | 2300 | Malaysia, Radio Malaysia | 7295do | | |
| 2200 | 2300 | Namibia, Namibian BC Corp | 3270af | 3290af | |
| | | 6060af | | | |
| 2200 | 2300 | DRM Netherlands, Radio | 15525na | | |
| 2200 | 2300 | New Zealand, Radio NZ Intl | 15720pa | | |
| 2200 | 2300 | Nigeria, Radio/Enugu | 6025do | | |
| 2200 | 2300 | Nigeria, Radio/Ibadan | 6050do | | |
| 2200 | 2300 | Nigeria, Radio/Kaduna | 4770do | 6090do | |
| 2200 | 2300 | Nigeria, Radio/Lagos | 3326do | 4990do | |
| 2200 | 2300 | Nigeria, Voice of | 7255af | 15120af | 17800af |
| 2200 | 2300 | Papua New Guinea, NBC | 4890do | 9675irr | |
| 2200 | 2300 | Sierra Leone, Radio UNAMSIL | 6139af | | |
| 2200 | 2300 | Sierra Leone, SLBS | 3316do | | |
| 2200 | 2300 | vi Solomon Islands, SIBC | 5020do | 9545do | |
| 2200 | 2300 | Taiwan, Radio Taiwan Intl | 15600eu | | |
| 2200 | 2300 | UK, BBC World Service | 5965as | 6195va | |
| | | 7105as | 9605as | 9740as | 11955as |
| | | 17830af | | | |
| 2200 | 2300 | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | 12133usb | 12579usb | 13362usb | 13855usb |
| 2200 | 2300 | USA, KAIJ Dallas TX | 13815va | | |
| 2200 | 2300 | USA, KBTN Salt Lake City UT | 15590na | | |
| 2200 | 2300 | USA, KVOH Rancho Simi CA | 17775as | | |
| 2200 | 2300 | USA, KWHR Naalehu HI | 17510as | | |
| 2200 | 2300 | USA, Voice of America | 7215va | 15185va | |
| | | 15290va | 15305va | 17740va | 17820va |
| 2200 | 2300 | USA, Voice of America | 7215va | 15185va | |
| | | 15290va | 15305va | 17740va | 17820va |
| 2200 | 2300 | USA, WBCQ Kennebunk ME | 5105na | 7415na | |
| | | 9330na | 17495na | | |
| 2200 | 2300 | USA, WBOH Newport NC | 5920am | | |
| 2200 | 2300 | USA, WEWN Birmingham AL | 9355na | 9975af | |
| | | 13615na | 15745na | | |
| 2200 | 2300 | USA, WHRA Greenbush ME | 17650na | | |
| 2200 | 2300 | USA, WHRI Noblesville IN | 9495am | 13770am | |
| 2200 | 2300 | USA, WINB Red Lion PA | 13570am | | |
| 2200 | 2300 | USA, WJIE Louisville KY | 7490am | 13595am | |
| 2200 | 2300 | USA, WMLK Bethel PA | 15265eu | | |
| 2200 | 2300 | USA, WRMI Miami FL | 9955am | 15725am | |
| 2200 | 2300 | USA, WTJC Newport NC | 9370na | | |
| 2200 | 2300 | USA, WWCR Nashville TN | 7465na | 12160na | |
| | | 13845na | | | |
| 2200 | 2300 | USA, WWRB Manchester TN | 5050na | 5085na | |
| | | 6890na | | | |
| 2200 | 2300 | USA, WYFR Okeechobee FL | 11740na | 15695na | |
| | | 15770na | | | |
| 2200 | 2300 | vi Vanuatu, Radio | 4960do | 7260do | |
| 2200 | 2300 | Zambia, Radio Christian Voice | 4965af | | |
| 2205 | 2230 | Italy, RAI Intl | 11895as | | |
| 2230 | 2257 | Czech Rep, Radio Prague Intl | 7345na | 9415na | |
| 2230 | 2259 | Canada, Radio Canada Intl | 9525as | 11810as | |
| | | 12035as | | | |
| 2230 | 2300 | Australia, HCJB | 15525as | | |
| 2230 | 2300 | Germany, Bible Voice Broadcasting | 9705as | 9950as | |
| 2245 | 2300 | India, All India Radio | 11620as | 11645as | 13605as |

2300 UTC - 7PM EDT / 6PM CDT / 4PM PDT

| | | | | | |
|------|------|-----------------------------------|----------|----------|----------|
| 2300 | 0000 | Anguilla, Caribbean Beacon | 6090am | | |
| 2300 | 0000 | Australia, ABC NT Alice Springs | 2310do | 4835irr | |
| 2300 | 0000 | Australia, ABC NT Katherine | 5025do | | |
| 2300 | 0000 | Australia, ABC NT Tennant Creek | 4910do | | |
| 2300 | 0000 | Australia, HCJB | 15525as | | |
| 2300 | 0000 | Bulgaria, Radio | 9700na | 11700na | |
| 2300 | 0000 | Canada, CBC Northern Service | 9625do | | |
| 2300 | 0000 | Canada, CFRX Toronto ON | 6070do | | |
| 2300 | 0000 | Canada, CFVP Calgary AB | 6030do | | |
| 2300 | 0000 | Canada, CKZN St John's NF | 6160do | | |
| 2300 | 0000 | Canada, CKZU Vancouver BC | 6160do | | |
| 2300 | 0000 | Canada, Radio Canada Intl | 5960am | 13785am | |
| 2300 | 0000 | China, China Radio Intl | 5990na | 6145am | |
| | | 13680ca | | | |
| 2300 | 0000 | Costa Rica, University Network | 13750am | | |
| 2300 | 0000 | Egypt, Radio Cairo | 11725na | | |
| 2300 | 0000 | Germany, Bible Voice Broadcasting | | 5925me | |
| 2300 | 0000 | Germany, Deutsche Welle | 9800as | | |
| 2300 | 0000 | Ghana, Ghana BC Corp | 3366do | 4915do | |
| 2300 | 0000 | Guyana, Voice of | 3290do | | |
| 2300 | 0000 | India, All India Radio | 9705as | 9950as | |
| | | 11620as | 11645as | 13605as | |
| 2300 | 0000 | Malaysia, Radio Malaysia | 7295do | | |
| 2300 | 0000 | Namibia, Namibian BC Corp | 3270af | 3290af | |
| | | 6060af | | | |
| 2300 | 0000 | New Zealand, Radio NZ Intl | 15720pa | | |
| 2300 | 0000 | Papua New Guinea, NBC | 4890do | 9675irr | |
| 2300 | 0000 | Sierra Leone, Radio UNAMSIL | 6139af | | |
| 2300 | 0000 | Sierra Leone, SLBS | 3316do | | |
| 2300 | 0000 | Singapore, Mediacorp Radio | 6150do | | |
| 2300 | 0000 | Solomon Islands, SIBC | 5020do | 9545do | |
| 2300 | 0000 | USA, Armed Forces Radio | 4319usb | 5446usb | |
| | | 5765usb | 6350usb | 7507usb | 10320usb |
| | | 12133usb | 12579usb | 13362usb | 13855usb |
| 2300 | 0000 | USA, KAIJ Dallas TX | 13815va | | |
| 2300 | 0000 | USA, KBTN Salt Lake City UT | 15590na | | |
| 2300 | 0000 | USA, KVOH Rancho Simi CA | 17775as | | |
| 2300 | 0000 | USA, KWHR Naalehu HI | 17510as | | |
| 2300 | 0000 | USA, Voice of America | 7225as | 11965as | |
| | | 12055as | 13755as | 15145as | |
| 2300 | 0000 | USA, WBCQ Kennebunk ME | 5105na | 7415na | |
| | | 9330na | | | |
| 2300 | 0000 | USA, WBOH Newport NC | 5920am | | |
| 2300 | 0000 | USA, WEWN Birmingham AL | 9355na | 9975af | |
| | | 13615na | 15745na | | |
| 2300 | 0000 | USA, WHRA Greenbush ME | 7580va | | |
| 2300 | 0000 | USA, WHRI Noblesville IN | 9495am | 13770am | |
| 2300 | 0000 | USA, WINB Red Lion PA | 9320am | | |
| 2300 | 0000 | USA, WJIE Louisville KY | 7490am | 13595am | |
| 2300 | 0000 | USA, WRMI Miami FL | 7385am | 9955am | |
| 2300 | 0000 | USA, WTJC Newport NC | 9370na | | |
| 2300 | 0000 | USA, WWCR Nashville TN | 7465na | 12160na | |
| | | 13845na | | | |
| 2300 | 0000 | USA, WWRB Manchester TN | 5050na | 5085na | |
| | | 6890na | | | |
| 2300 | 0000 | USA, WYFR Okeechobee FL | 5985na | 11740na | |
| | | 11855na | 15255na | 17750na | |
| 2300 | 0000 | USA, WYFR Okeechobee FL | 5985na | 11855ca | |
| | | 17750na | | | |
| 2300 | 0000 | vi Vanuatu, Radio | 4960do | 7260do | |
| 2300 | 0000 | Zambia, Radio Christian Voice | 4965af | | |
| 2300 | 2306 | Nigeria, Radio/Lagos | 3326do | | |
| 2300 | 2330 | Australia, Radio | 9660pa | 12080va | 13620as |
| | | 15320as | 17585pa | 17715as | 17795va |
| | | 21740as | | | |
| 2300 | 2330 | vi Croatia, Croatian Radio | 9925sa | | |
| 2300 | 2330 | Cuba, Radio Havana | 9550ca | | |
| 2300 | 2330 | UK, BBC World Service | 3915as | 5965as | |
| | | 6195as | 9605as | 9740as | 11955as |
| | | 15280as | | | |
| 2300 | 2356 | Romania, Radio Romania Intl | 7280au | 9590au | |
| | | 9645au | 11940au | | |
| 2300 | 2359 | Germany, Deutsche Welle | 7115as | 9890as | |
| | | 15135as | | | |
| 2305 | 2330 | as Austria, Radio Austria Intl | 9870sa | | |
| 2315 | 2330 | Austria, Radio Austria Intl | 9870sa | | |
| 2330 | 0000 | Australia, Radio | 9660pa | 12080va | 13620as |
| | | 15320as | 17585pa | 17715pa | 17750as |
| | | 17795as | 21740as | | |
| 2330 | 0000 | Lithuania, Radio Vilnius | 9875na | | |
| 2330 | 0000 | UK, BBC World Service | 3915as | 5965as | |
| | | 6035as | 6195as | 9605as | 9740as |
| | | 11955as | 15280as | | |
| 2330 | 0000 | USA, Voice of America | 7225as | 7260as | |
| | | 11805as | 11965as | 12055as | 13725as |
| | | 15145as | 15205as | | |
| 2330 | 2358 | vi Vietnam, Voice of | 9840as | 12020as | |
| 2330 | 2359 | Sweden, Radio | 9800na | | |
| 2335 | 0000 | as Austria, Radio Austria Intl | 9870sa | | |

**Headnotes:**

1. On June 21, **Radio Canada International** instituted some changes and additions to its US-targeted schedule. **RCI** is now on shortwave 10 hours a day to the USA: 1200-1500 M-F and 1300-1600 S/A; 1900-2200 (new!), 2200-0200 D. All but the 1900-2100 programs are in the main listings. Here's the roster for those two hours: **1900 S Tapestry** (spiritual matters), **M-F Richardson's Roundup** (variety), **A Definitely Not the Opera** (pop culture); **2000 S Cross Country Check-Up** (phone-in).

2. On weekends, **RCI** now goes up against **Radio Netherlands** which broadcasts to North America 1900-2100 S/A. Because of space restrictions in the main listings, here's **RN's** schedule for those hours: **1900 S Documentary**, **A Vox Humana** (culture); **1930 S/A News**; **1935 S Wide Angle** (in-depth), **A Europe Unzipped**; **1955 S The Week Ahead** (on RN), **A Insight** (commentary). **2000 S Vox Humana**, **A Amsterdam Forum** (issues interactive); **2030 S/A News**; **2035 S Wide Angle**, **A Europe Unzipped**; **2055 S The Week Ahead**, **A Insight**.

3. **BBCWS** stream abbreviations: **(am)**=Americas; **(eu)**=Europe; **(waf)**=West Africa.

4. The **0400, 0500, 0600, 1600** and **2100** broadcasts remains among the best bets for those in North America to hear **Deutsche Welle** on shortwave. **DW** programs aired during these hours are included in the listings.

5. **Dates and times, in UTC**, are approximate. Programs and times are always **subject to change**. This is especially true for the U.S. based private broadcasters.

0000 UTC/ 8pm E/5pm P - Page 45 Freqs

NEWSCASTS (*extended)

| | | |
|------|---------------------|---------------------------|
| 0000 | BBCWS(am) | D News |
| | R. Australia | D News |
| | R. Canada Int. | T-A ... The World at Six* |
| | R. Japan | D World News |
| | R. Netherlands | S/M ... News |
| | R. New Zealand Int. | S/A News |
| | | M-F. Midday Report* |
| | R. Prague | D News |
| | R. Ukraine Int. | D News |
| | Spanish Foreign R. | T-A ... REE News Service* |

CURRENT AFFAIRS MAGAZINES/FEATURES

| | | |
|------|----------------|--|
| 0000 | R. Canada Int. | S/M ... The World This Weekend |
| | R. Netherlands | T-A ... Newsline |
| 0005 | R. Netherlands | S Wide Angle |
| 0006 | BBCWS(am) | F Assignment (in-depth report) |
| 0010 | R. Australia | H Background Briefing (documentaries) |
| | | A Pacific Review |
| 0015 | R. Japan | T-A ... 44 Minutes |
| 0025 | R. Netherlands | M Insight (commentary) |
| 0030 | R. Canada Int. | T-A ... As It Happens (interviews) |

BUSINESS/ECONOMICS (also in **NEWSCASTS** & **Current Affairs**)

| | | |
|------|----------------|---|
| 0015 | R. Prague | F Business Report |
| 0030 | R. Netherlands | A A Good Life (development issues) |
| 0032 | BBCWS(am) | F The Music Biz |

SCIENCE/TECHNOLOGY (incl. **Health & Environment**)

| | | |
|------|----------------|---------------------------------|
| 0010 | R. Australia | T The Science Show |
| | R. Prague | W Czech Science |
| 0030 | R. Netherlands | T The Research File |
| 0045 | R. Australia | A Ockham's Razor (opinion) |

ARTS AND CULTURE

| | | |
|------|--------------------|--|
| 0000 | Spanish Foreign R. | M Window on Spain |
| 0006 | BBCWS(am) | W Masterpiece (cultural ideas) |
| 0010 | R. Australia | M Away! (Aboriginal) |
| | R. Prague | A The Arts |
| 0015 | R. Prague | M Czech Books (biweekly) |
| | | A Stepping Out (Prague nightlife) |
| | Spanish Foreign R. | S/M ... History or cultural series |
| 0030 | R. Netherlands | M Vox Humana |

| | | |
|------|--------------------|--|
| 0035 | R. Ukraine Int. | M Roots |
| 0048 | Spanish Foreign R. | T-A ... A Language Without Bounds (lesson) |

LOCAL LIVES AND VIEWS

| | | |
|------|---------------------|--|
| 0000 | Spanish Foreign R. | S Visitors Book |
| 0005 | R. Australia | A Inside Out (Pacific islanders) |
| | R. Netherlands | M Europe Unzipped |
| | R. Prague | S Magazine |
| | | T-A ... Current Affairs |
| | R. Ukraine Int. | T-A ... Ukraine Today |
| 0010 | R. Australia | W The National Interest |
| | | F Hindsight (social history) |
| | R. Japan | M Weekend Japanology |
| | R. Prague | S Letter from Prague |
| | | M ABC of Czech (language) |
| 0012 | R. New Zealand Int. | S ... The Week in Parliament |
| | | A Focus on Politics |
| 0015 | R. Prague | S/W ... One on One (interview) |
| | | T Talking Point |
| | | H Czechs in History [or] Czechs Today [or] Spotlight (places) |
| 0017 | Spanish Foreign R. | T-A ... Spain Day-by-Day (magazine) |
| 0030 | R. Netherlands | W EuroQuest (Europe in context) |
| | | F Dutch Horizons |
| 0033 | R. New Zealand Int. | S ... Spectrum |

INFORMATIONAL FEATURES

| | | |
|------|----------------|---|
| 0006 | BBCWS(am) | M Everywoman (magazine) |
| | | T Documentaries |
| | | H Love (anthropological view-5th/12th) |
| | | Documentaries (19th/26th) |
| 0030 | R. Netherlands | H Documentary |

MUSIC

| | | |
|------|---------------------|---|
| 0006 | BBCWS(am) | S Top of the Pops (UK music charts) |
| 0010 | R. Ukraine Int. | M Music from Ukraine |
| 0015 | R. Prague | M Encore [or] Magic Carpet (monthly) |
| 0032 | BBCWS(am) | T The Music Feature |
| | | W White Label (new) |
| | | H Charlie Gillett (world) |
| | | A John Peel (eclectic) |
| 0033 | R. New Zealand Int. | A ... The Sampler (new CDs) |

ENTERTAINMENT

| | | |
|------|----------------|---|
| 0000 | WBCQ (7415) | M Radio New York International |
| | WBCQ (5105) | M Firesign Theatre Hour (satire) |
| 0030 | R. Canada Int. | S Madly Off in All Directions (comedy) |
| 0032 | BBCWS(am) | M Westway Omnibus (drama serial) |

SWL, MEDIA AND COMMUNICATIONS

| | | |
|------|--------------------|----------------------------------|
| 0018 | R. Ukraine Int. | S Whole World on Radio Dial |
| 0030 | WHRI (7315) | S DXing with Cumbre |
| 0045 | R. Bulgaria | A R. Bulgaria Calling |
| | R. Canada Int. | M CIDX Report (fortnightly) |
| | Spanish Foreign R. | S Radio Waves |

LISTENER CONTACT/INTERACTIVE

| | | |
|------|-----------------|---|
| 0000 | WBCQ (9330) | S Allan Weiner Worldwide |
| | WBCQ (7415) | A Allan Weiner Worldwide |
| 0005 | R. Prague | M Mailbox |
| | WHRA (7580) | T-A ... For the People (populism) |
| 0010 | R. Japan | S Hello from Tokyo |
| 0030 | R. Canada Int. | M Maple Leaf Mailbag |
| | R. Netherlands | S Amsterdam Forum (topical issues) |
| 0035 | R. Ukraine Int. | S Hello from Kiev |

SPORT

| | | |
|------|-----------|--|
| 0006 | BBCWS(am) | A Sports International (magazine) |
|------|-----------|--|

0100 UTC/ 9pm E/6pm P - Page 45 Freqs

NEWSCASTS (*extended)

| | | |
|------|----------------|------------------------|
| 0100 | BBCWS(am) | D News |
| | China R. Int. | D News & Reports* |
| | R. Australia | D News |
| | R. Budapest | D News |
| | R. Canada Int. | D News |
| | R. Habana Cuba | D News |
| | R. Netherlands | S/M ... News |

| | | |
|------|---------------------|----------------------------|
| | R. New Zealand Int. | S/A News |
| | | M-F. Pacific Regional News |
| | R. Prague | D News |
| | R. Slovakia Int. | D News |
| | Voice of Russia | D News |
| | Voice of Vietnam | D News |
| 0130 | VOA Spec. Eng. | T-A ... News |

CURRENT AFFAIRS MAGAZINES/FEATURES

| | | |
|------|------------------|--|
| 0100 | R. Netherlands | T-A ... Newsline |
| 0105 | R. Australia | S Correspondents' Report |
| | | A Asia Pacific Weekend Edition |
| | R. Canada Int. | T-A ... As It Happens (cont'd from 0030) |
| | R. Netherlands | M Wide Angle (one topic focus) |
| 0110 | China R. Int. | S Report on Developing Countries |
| | R. Australia | M-F. Asia Pacific |
| | R. Habana Cuba | M Weekly Review |
| | R. Slovakia Int. | T Insight Central Europe |
| 0115 | R. Habana Cuba | T-S ... Viewpoint |
| 0120 | China R. Int. | S CRI Roundup |
| 0130 | R. Canada Int. | H Dispatches (CBC correspondents) |
| | R. Sweden | T-A ... 60 Degrees North |
| 0140 | R. Habana Cuba | A Weekly Review |
| | VOA Spec. Eng. | A In the News |

BUSINESS/ECONOMICS (also in **NEWSCASTS** & **Current Affairs**)

| | | |
|------|---------------------|---|
| 0105 | R. Budapest | M Europe Unlimited (trade-monthly) |
| 0106 | R. New Zealand Int. | F A. Your Money |
| 0115 | R. Prague | F Business Report |
| | Voice of Vietnam | F Vietnam Economy |
| 0130 | China R. Int. | T Biz China |
| 0140 | VOA Spec. Eng. | T Development Report |

SCIENCE/TECHNOLOGY (incl. **Health & Environment**)

| | | |
|------|----------------|--|
| 0106 | BBCWS(am) | T Health Matters |
| | | W Go Digital |
| | | H Discovery (research) |
| | | F One Planet (ecology) |
| | | A Science in Action (magazine) |
| 0110 | R. Prague | W Czech Science |
| 0115 | China R. Int. | A Cutting Edge |
| 0130 | R. Australia | S In Conversation |
| | | M The Health Report |
| 0140 | VOA Spec. Eng. | W Agriculture Today |
| | | H Health Report |
| | | A Environment Report |
| 0145 | R. Sweden | F Green Scan (environment)[2nd F] |
| | | Heart Beat (health)[3rd F] |
| | VOA Spec. Eng. | W Science in the News |
| | | H Explorations |
| 0150 | R. Habana Cuba | M Breakthrough |

ARTS & CULTURAL

| | | |
|------|---------------------|--|
| 0105 | R. Budapest | M Spotlight (monthly) |
| | R. Canada Int. | M Writers & Co. |
| 0106 | BBCWS(am) | M The Ticket (global survey) |
| | R. New Zealand Int. | S ... At the Movies |
| 0110 | R. Prague | A The Arts |
| 0115 | R. Prague | M Czech Books (biweekly) |
| | | A Stepping Out (Prague nightlife) |
| | Voice of Vietnam | W ... Culture & Society |
| 0120 | Voice of Vietnam | A Literature & Arts |
| 0130 | China R. Int. | S In the Spotlight |
| | R. New Zealand Int. | S ... Bookmarks |
| | | [exc. last S: National Radio Bookclub] |
| | R. Sweden | S Spectrum [3rd S] |
| 0132 | BBCWS(am) | F The Word (books, writers & readers) |
| | | [exc. last F: World Book Club] |
| 0145 | VOA Spec. Eng. | A American Stories |
| | | H The Making of a Nation |

LOCAL LIVES AND VIEWS

| | | |
|------|------------------|---|
| 0105 | R. Austria Int. | S/M ... Insight Central Europe |
| | R. Budapest | S Insight Central Europe |
| | | M Heading for Hungary (monthly) |
| | | T-A ... Hungary Today |
| | R. Netherlands | S Europe Unzipped |
| | R. Prague | M Magazine (local color) |
| | | T-A ... Current Affairs |
| | Voice of Vietnam | D Current Affairs |
| 0110 | R. Prague | S Letter from Prague |
| | | M ABC of Czech (language) |
| | R. Slovakia Int. | T-A ... Slovakia Today (feature magazine) |
| 0111 | Voice of Russia | T-A ... Commonwealth Update |

Shortwave Guide



- 0115 R. Austria Int. T-A... Report from Austria
R. Prague S/W... One on One (interview)
T..... Talking Point
H..... Czechs in History [or]
Czechs Today [or]
Spotlight (places)
Voice of Vietnam T..... Vietnam: Land and
People
A..... Rural Vietnam
0130 China R. Int. M..... People in the Know
W..... China Horizons
H..... Voices from Other Lands
F..... Life in China
R. Australia A..... The Chat Room
(interviews)
R. Sweden S..... Network Europe (1st S)
..... Sweden Today (2nd S)
..... Studio 49 (4th S)
0132 Voice of Russia S..... Moscow Yesterday and
Today
0135 R. Austria Int. S/M... Insight Central Europe
0140 R. Habana Cuba T/H/F Caribbean Outlook
0145 R. Austria Int. T-A... Report from Austria
R. Sweden W..... Close-Up (profiles of
Swedes)
H..... Nordic Lights [1st H]
..... The S-Files (things
Swedish) [4th H]
VOA Spec. Eng. T..... This is America
F..... Making of a Nation
A..... American Mosaic
0154 Voice of Russia H..... Russia: People and
Events

INFORMATIONAL FEATURES

- 0100 WBCQ (7415) T..... The Secular Bible Study
(critique)
0130 R. Australia T..... The Law Report
W..... The Religion Report
0132 Voice of Russia A..... Christian Message from
Moscow
0140 VOA Spec. Eng. F..... Education Report
0145 BBCWS(am) H..... Heart and Soul (beliefs &
values)
A..... What's the Problem?
(advice)

MUSIC

- 0105 R. Canada Int. S..... Global Village (world/
folk)
WHRA (7580) S..... Turn Your Radio On
(southern gospel)
WHRI (7315) S..... Turn Your Radio On
(southern gospel)
0106 R. New Zealand Int. M-F..... Wayne's Music
(favorites)
0115 R. Prague S..... Encore [or] Magic
Carpet (monthly)
0120 Voice of Vietnam S..... Vietnamese Music
0130 R. Sweden M..... Sounds Nordic [exc. 1st
M]
0132 BBCWS(am) W..... Music Review (magazine)
Voice of Russia T..... Folk Box
W..... Jazz Show
H..... Musical Tales of St. Petersburg
F..... Moscow Calling (rock)
0146 Voice of Russia F..... Music At Your Request

ENTERTAINMENT

- 0100 WBCQ (5105) M..... Tesla's Ear (radio
theatre)
WBCQ (7415) S..... Marion's Attic (vintage
recordings)
M..... Radio New York
International
A..... Tasha Takes Control
WBCQ (9330) M..... Odin Lives (Norse
legends/music)
0101 BBCWS(am) S..... Play of the Week (radio
theatre)
0110 Voice of Vietnam M..... Sunday Show
0130 R. New Zealand Int. A..... Comedy Zone
0132 BBCWS(am) T..... Inspiration (science quiz)
H/S... Westway (drama serial)
Voice of Russia M..... Timelines

SWL, MEDIA AND COMMUNICATIONS

- 0115 R. Canada Int. M..... CIDX Report (bi-weekly)
0120 R. Budapest A..... DX Corner
0130 R. Australia H..... The Media Report
0135 R. Habana Cuba S/W... DXers Unlimited

LISTENER CONTACT/INTERACTIVE

- 0105 R. Budapest M..... And the Gatepost
(monthly)
R. Canada Int. M..... Maple Leaf Mailbag
R. Prague M..... Mailbox
0110 R. Slovakia Int. M..... Listeners' Tribune
0111 Voice of Russia S/M... Moscow Mailbag
0115 Voice of Vietnam H..... Letterbox
0125 R. Austria Int. S/M... Listener Letters

- 0130 China R. Int. A..... Listeners' Garden
R. Sweden M..... In Touch w/Stockholm
(1st M)
0140 R. Habana Cuba M..... Mailbag Show
0155 R. Austria Int. S/M... Listener Letters
SPORT
0130 R. Australia F..... The Sports Factor
0135 R. Habana Cuba T-A... Time Out
0135 R. New Zealand Int. D..... Live Sport (as
available)
0145 R. Sweden T..... Sports Scan

0200 UTC/ 10pm E/7pm P - Page 46 Freqs

NEWSCASTS (*extended)

- 0200 BBCWS(am) D..... The World Today*
R. Australia D..... News
R. Bulgaria D..... News
R. Habana Cuba D..... News
R. Korea Int. D..... News
R. New Zealand Int. D..... D. News
R. Taiwan Int. D..... News
Voice of Russia D..... News
0230 R. Budapest D..... News
Voice of Vietnam D..... News

CURRENT AFFAIRS MAGAZINES/FEATURES

- 0205 R. Australia A..... Background Briefing
(documentaries)
0210 R. Australia M-F... The World Today
0211 Voice of Russia M..... Sunday Panorama
TS... News & Views
0230 R. Sweden T-A... 60 Degrees North
0245 BBCWS(am) T/W/F/A Analysis
H..... From Our Own
Correspondent
0255 R. Australia A..... Perspective

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

- 0232 BBCWS(am) S..... Global Business (trends/
ideas)
M..... World Business Review
T-A... World Business Report
0235 R. Budapest M..... Europe Unlimited (trade-
monthly)
0245 Voice of Vietnam F..... Vietnam Economy

SCIENCE/TECHNOLOGY (incl. Health & Environment)

- 0204 R. New Zealand Int. A..... Eureka
0230 R. New Zealand Int. A..... Health [or]
Environment Matters
0245 R. Sweden F..... Green Scan
(ecology)[2nd F]
..... Heart Beat (health)[3rd
F]

ARTS AND CULTURE

- 0220 R. Taiwan Int. F..... Culture Express
0230 R. Bulgaria T..... Bulgarian Plaza
R. Sweden S..... Spectrum [3rd S]
R. Budapest M..... Spotlight (monthly)
0235 Voice of Vietnam W..... Culture & Society
0245 Voice of Vietnam A..... Literature and Arts

LOCAL LIVES AND VIEWS

- 0210 R. Bulgaria T-A... Events & Developments
R. Taiwan Int. T..... Kaleidoscope
R. Korea Int. T-A... Seoul Calling (magazine)
0220 R. Taiwan Int. S..... Taipei Magazine
M..... Discover Taiwan
T..... Walks & Talks
T..... Korea Today &
Tomorrow
W..... Korean Kaleidoscope
(society)
H..... Wonderful Korea
(travelogue)
F..... Seoul Report (around
the capital)
R. Sweden S..... Weekend (Europe
magazine)[1st S]
..... Sweden Today [2nd S]
..... Studio 49 (topical
discussion)[4th S]
Voice of Russia T..... Kaleidoscope (events)
H..... Moscow Yesterday and
Today
0235 R. Budapest S..... Insight Central Europe
M..... Heading for Hungary
(monthly)
T-A... Hungary Today
R. Bulgaria W-M... Keyword Bulgaria
0240 R. Taiwan Int. S..... Hakka World (native
Taiwanese)
0245 R. Sweden W..... Close Up (profiles) [1st
W]
F..... Nordic Report [1st F]

- The S-Files (things
Swedish)[4th F]
A..... Review of the Newsweek
T..... Vietnam: Land & People
A..... Rural Vietnam
W..... Russia: People & Events
Voice of Vietnam
0254 Voice of Russia

INFORMATIONAL FEATURES

- 0232 Voice of Russia M/F... Russian by Radio
0235 R. Habana Cuba S..... The World of Stamps
0245 BBCWS(am) M..... The Instant Guide (issue
background)
R. Taiwan Int. T..... Let's Learn Chinese

MUSIC

- 0200 WBCQ (5105) M..... Squad 51 (dance,
trance, active rock)
WBCQ (7415) M..... Radio NY International
[cont'd]
0210 R. Bulgaria M..... Folk Studio
R. Habana Cuba M..... From Habana
R. Korea Int. M..... Korean Pop Interactive
0220 R. Taiwan Int. W..... Jade Bells and Bamboo
Pipes (traditional)
0230 R. Habana Cuba M..... The Jazz Place [or] Top
Tens
R. Sweden M..... Sounds Nordic [exc. 1st
M]
WHRA (7580) S..... World Harvest Country
Style
0332 Voice of Russia S..... Songs from Russia
W..... Musical Portraits
0250 Voice of Vietnam S..... Music (Vietnamese)

ENTERTAINMENT

- 0200 WBCQ (7415) S..... Pan Global Wireless
0205 R. Australia S..... Margaret Throsby
Interview
0232 Voice of Russia A..... Audio Book Club
0240 Voice of Vietnam M..... Sunday Show
0245 R. Taiwan Int. H..... Instant Noodles (the
weird news)

SWL, MEDIA AND COMMUNICATIONS

- 0200 WRMI (7385) S..... Wavescan
WWCR (3210) M..... Cyber Line (digital)
WWCR (5070) S..... DX Partyline
0230 WHRA (7580) S..... DXing with Cumbre
WRMI (7385) S..... Voice of the NASB
M..... Wavescan
WWCR (5070) S..... World of Radio
0245 R. Bulgaria S..... R. Bulgaria Calling
0250 R. Budapest A..... DX Corner

LISTENER CONTACT/INTERACTIVE

- 0210 R. Korea Int. S..... Worldwide Friendship
0220 R. Taiwan Int. T..... Mailbag Time
0230 R. Sweden M..... In Touch with Stockholm
[1st M]
0235 R. Budapest M..... And the Gatepost
[monthly]
R. Bulgaria T..... Answering Your Letters
0245 Voice of Vietnam H..... Letterbox
0246 Voice of Russia S..... You Write to Moscow

SPORT

- 0200 R. New Zealand Int. D..... Live Sport (as
available)
0205 R. Australia S/A... Grandstand (live sports
action*)
0245 R. Sweden T..... Sport Scan
(*special on 9660, 12080, 15240, 17750 kHz. only.)

0300 UTC/ 11pm E/8pm P - Page 46 Freqs

NEWSCASTS (*extended)

- 0300 BBCWS(am) D..... News
China R. Int. D..... News & Reports*
R. Australia D..... News
R. Habana Cuba D..... News
R. New Zealand Int. S/A... News
M-F... Pacific Regional News
D..... News
R. Prague D..... News
R. Taiwan Int. D..... News
R. Ukraine Int. D..... News
Voice of Russia D..... News
Voice of Turkey D..... News
0330 VOA Africa M-F... News
Voice of Vietnam D..... News

CURRENT AFFAIRS MAGAZINES/FEATURES

- 0300 VOA Africa M-F... Daybreak Africa
0305 Voice of Turkey D..... Press Review
0306 BBCWS(am) S..... From Our Own
Correspondent
T-A... Outlook (magazine)
0310 China R. Int. S..... Report on Developing
Countries
R. Habana Cuba M..... Weekly Review

Shortwave Guide



- 0315 R. New Zealand Int. M-F Dateline Pacific
 0320 R. Habana Cuba T-S ... Viewpoint
 0330 China R. Int. S CRI Roundup
 0330 R. New Zealand Int. F . Pacific Correspondent
 R. Sweden T-A ... 60 Degrees North
 0332 BBCWS(am) S The Interview (trends)
 0340 R. Habana Cuba T/H/F Caribbean Outlook
 A Weekly Review
 0345 R. Sweden A Review of the Newswreck
 VOA Africa M-F . Dateline (daily documentary)

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

- 0310 R. Taiwan Int. M Taiwan Economic Journal
 0311 Voice of Russia F Newmarket
 0315 R. Prague F Business Report
 0330 China R. Int. T Biz China
 R. New Zealand Int. W Tradewinds
 0333 VOA Africa M-F . Business Report
 0345 Voice of Vietnam F Vietnam Economy

SCIENCE/TECHNOLOGY (incl. Health & Environment)

- 0311 Voice of Russia H Science Plus
 0315 China R. Int. A Sci-Tech
 0345 R. Sweden F Greenscan (ecology-2nd wk.)
 Heartbeat (health-3rd wk.)
 0350 R. Habana Cuba M Breakthrough

ARTS AND CULTURE

- 0310 R. Prague M ABC of Czech (language)
 A The Arts
 0315 R. Prague M Czech Books (biweekly)
 A Stepping Out (Prague nightlife)
 0320 R. Taiwan Int. F Culture Express
 A Stage, Screen & Studio
 0330 China R. Int. S In the Spotlight
 R. Sweden S Spectrum (3rd wk.)
 R. Ukraine Int. M Roots
 0332 Voice of Russia F Russian history/culture program
 0345 Voice of Vietnam W Culture and Society
 0350 Voice of Vietnam A Literature & Arts

LOCAL LIVES AND VIEWS

- 0305 R. Australia S Australian Express (magazine)
 A Rural Reporter (outback)
 R. Prague T-A Magazine (local color)
 S Current Affairs
 0310 R. Ukraine Int. T-A Ukraine Today
 R. Prague S Letter from Prague
 R. Taiwan Int. T Kaleidoscope (society)
 0311 Voice of Russia M This is Russia
 0315 R. Prague S/W . One on One (interview)
 T Talking Point (Czech issues)
 H Czechs in History [or]
 Czechs Today [or]
 Spotlight (places)
 Voice of Turkey S Outlook
 0320 R. Australia M-F . Life Matters (social issues)
 0330 China R. Int. M People in the Know
 W China Horizons
 H Voices from Other Lands
 F Life in China
 R. Sweden S Network Europe (magazine-1st wk)
 Sweden Today (2nd wk)
 Studio 49 (topical discussion-4th wk)
 0340 R. Taiwan Int. S Hakka World (indigenous culture)
 0345 R. Sweden F Nordic Report (1st wk.)
 The S-Files (things Swedish-4th wk)
 A Review of the Newswreck
 Voice of Vietnam T Vietnam: Land and People
 A Rural Vietnam
 0354 R. Australia S/A .. Heywire (Aussie rural youth views)

INFORMATIONAL FEATURES

- 0305 R. New Zealand Int. S .. RPM (international documentaries)
 0332 Voice of Russia T/H/A The River of Time
 0345 R. Taiwan Int. T Let's Learn Chinese

MUSIC

- 0300 WHRI (5745) S Powersource Top 20 (Christian rock)
 WRMI (7385) M VCS Radio (Christian hard rock)
 0302 WHRI (7315) S Countdown Magazine

- 0305 R. New Zealand Int. A . Home Grown (NZ performers)
 0310 R. Ukraine Int. M Music from Ukraine
 0311 Voice of Russia S Music & Musicians
 T Musical Portraits
 0315 R. Prague M Encore [or] Magic Carpet (monthly)
 Voice of Turkey M Tunes Spanning Centuries
 0320 R. Taiwan Int. W Jade Bells & Bamboo Pipes (traditional)
 0330 R. Australia S Jazz Notes
 A Australian Country Style
 R. New Zealand Int. A M. New Releases
 A Musical Chairs (NZ artist profile)
 R. Sweden M Sounds Nordic (rock-exc. 1st wk.)
 0332 Voice of Russia M Moscow Calling (rock)
 0350 Voice of Vietnam S Music (Vietnamese)

ENTERTAINMENT

- 0300 WBCQ (7415) S Michael Ketter (satire/free form)
 M Radio NY International [cont'd]
 WBCQ (9330) S Radio Timtron Worldwide
 0306 BBCWS(am) A Pick of the World (BBC's best)
 0340 R. Taiwan Int. H Instant Noodles ("wacky" news)
 Voice of Vietnam M Sunday Show
 0345 BBCWS(am) T-A .. Off the Shelf (book readings)

SWL, MEDIA AND COMMUNICATIONS

- 0300 WBCQ (5105) M The Pirate's Cove (pirate radio)
 WRMI (7385) S World Radio Network relay
 0315 R. Ukraine Int. S Whole World on Radio Dial
 0320 Voice of Turkey S DX Corner (fortnightly)
 0330 R. New Zealand Int. H . RNZI Talk (fortnightly)
 0340 R. Habana Cuba S/W . DXers Unlimited
 0345 R. Bulgaria S R. Bulgaria Calling

LISTENER CONTACT/INTERACTIVE

- 0305 R. Prague M Mailbox
 0306 BBCWS(am) M Talking Point (current issues)
 0310 Voice of Turkey W Live from Turkey
 0311 Voice of Russia W/A Moscow Mailbag
 0320 Voice of Turkey H Letterbox
 0330 China R. Int. A Listeners' Garden
 R. New Zealand Int. H . Mailbox (fortnightly)
 R. Sweden M In Touch with Stockholm (1st wk.)
 R. Ukraine Int. S Hello from Kiev
 0340 R. Habana Cuba M Mailbag Show
 R. Taiwan Int. A Mailbag Time
 0345 BBCWS(am) A Write On
 Voice of Vietnam H Letterbox

SPORT

- 0300 R. Australia S/A .. Grandstand (live action)*
 R. New Zealand Int. D . Live Sport (as available)
 0310 R. Australia M-F . Regional Sports Report
 0330 R. New Zealand Int. H . The World in Sport
 0335 R. Habana Cuba T-A .. Time Out
 0345 R. Sweden T Sportscan

(*special on 9660, 12080, 15240, 17750 kHz. only)

0400 UTC/ 12am E/9pm P - Page 47 Freqs

NEWSCASTS (*extended)

- 0400 BBCWS(am) D World Briefing*
 China R. Int. D News & Reports
 Deutsche Welle D News
 R. Australia D News
 R. Habana Cuba D News
 R. Netherlands S/A .. News
 R. New Zealand Int. D . News
 RvI Belgium T-A .. News
 VOA Africa M-F . News & Reports*
 Voice of Russia M News
 0432 BBCWS(am) M-F . The World Today*

CURRENT AFFAIRS MAGAZINES/FEATURES

- 0400 R. Netherlands T-A .. Newslime
 0405 Deutsche Welle S Inside Europe
 T-A .. Newslink Africa
 R. Netherlands W Wide Angle (one topic focus)
 0410 China R. Int. S Report on Developing

- 0415 VOA Africa M-F . Focus (one topic in-depth)
 0425 R. Netherlands S Insight (commentary)
 0430 Deutsche Welle T Insight (international affairs)
 VOA Africa M-F . Daybreak Africa
 0455 R. Australia M-F . Perspective

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

- 0411 Voice of Russia H Newmarket
 0430 BBCWS(am) S World Business Review
 China R. Int. T Biz China
 Deutsche Welle W World in Progress (development)
 H Money Talks
 R. Netherlands A A Good Life (development issues)
 0445 Deutsche Welle T Business German

SCIENCE/TECHNOLOGY (incl. Health & Environment)

- 0411 Voice of Russia W/A Science Plus
 0415 China R. Int. A Cutting Edge
 0430 Deutsche Welle F Living Planet
 A Spectrum
 R. Netherlands T Research File

ARTS AND CULTURE

- 0430 China R. Int. S In the Spotlight
 R. Netherlands M Vox Humana

LOCAL LIVES AND VIEWS

- 0405 R. Netherlands M Europe Unzipped
 R. New Zealand Int. M-F In Touch with NZ
 RvI Belgium T-A .. Flanders Today
 R. Australia M-F . Bush Telegraph (the outback)
 RvI Belgium M Tourism in Flanders
 0430 China R. Int. M People in the Know
 W China Horizons
 H Voices from Other Lands
 F Life in China
 R. Australia S The Chat Room (interviews)
 R. Netherlands W Euroquest (Europe in context)
 F Dutch Horizons
 0432 Voice of Russia S Kaleidoscope
 W Moscow Yesterday and Today

INFORMATIONAL FEATURES

- 0405 R. Australia S The Europeans
 0430 R. Netherlands H Documentary
 0435 R. Habana Cuba S The World of Stamps
 0432 BBCWS(am) A Reporting Religion
 0445 BBCWS(am) S The Instant Guide (backgrounder)

MUSIC

- 0400 RvI Belgium S Music from Flanders
 WHRI (5745) S Powersource Top 20 [cont'd]
 WHRI (7315) S Countdown Magazine [cont'd]
 0405 R. New Zealand Int. A . Home Grown (from 0305)
 0410 R. Habana Cuba M From Habana
 0411 Voice of Russia S/M . Musical Portraits
 0430 R. Habana Cuba M The Jazz Place [or] Top Tens
 0432 Voice of Russia T Music Around Us
 H Folk Box
 0447 Voice of Russia T Music At Your Request

ENTERTAINMENT

- 0400 WBCQ (7415) M-A . Amos 'n Andy (classic comedy)
 0405 R. New Zealand Int. S .. Sunday Drama (a play for radio)
 0415 WBCQ (7415) T Odin Lives (Norse myths/music)
 0432 Voice of Russia M/F Audio Book Club
 A Timelines

SWL, MEDIA AND COMMUNICATIONS

- 0400 RvI Belgium M Radio World
 WBCQ (7415) S Tom & Darryl (consumer electronics)
 WRMI (7385) S World Radio Network relay
 M Wavescan
 WWCR (5070) S Cyber Line (digital)
 0415 WBCQ (7415) M World of Radio
 0430 WRMI (7385) M World Radio Network relay

Listener Contact/Interactive

- 0405 Deutsche Welle M Mailbag

Shortwave Guide



0411 Voice of Russia T/F.. Moscow Mailbag
0415 RvI Belgium M.... Brussels 1043
0430 China R. Int. A..... Listeners' Garden
R. Netherlands S..... Amsterdam Forum

SPORT

0400 R. Australia S/A.. Grandstand (live action)*
0423 VOA Africa M-F.. Sports
(*special on 9660, 12080, 15240, 17750 kHz. only.)

0500 UTC/ 1am E/10pm P - Page 47 Freqs

NEWSCASTS (*extended)

0500 BBCWS(waf)(eu) D..... The World Today*
China R. Int. D..... News & Reports*
Deutsche Welle D..... News
R. Australia D..... News
R. Habana Cuba D..... News
R. Japan D..... News
R. New Zealand Int. D..... D. News
VOA Africa M-F.. News & Reports*

CURRENT AFFAIRS MAGAZINES/FEATURES

0500 Channel Africa S..... Network Africa
M-F.. Dateline Africa
0505 Deutsche Welle T-A... Newslink Africa
R. New Zealand Int. M-F..... Checkpoint
0510 China R. Int. S..... Report on Developing Countries
R. Australia M-F.. Pacific Beat
R. Habana Cuba M..... Weekly Review
0515 R. Habana Cuba T-S... Viewpoint
R. Japan M-F.. 44 Minutes
0520 China R. Int. S..... CRI Roundup
0540 R. Habana Cuba T/H/F Caribbean Outlook
A..... Weekly Review
M-F.. Dateline (short documentary)
0545 VOA Africa

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

0530 China R. Int. T..... Biz China
0533 VOA Africa M-F.. Business Report

SCIENCE/TECHNOLOGY (incl. Health & Environment)

0515 China R. Int. A..... Cutting Edge
0530 WWCR (5070) M-F.. Natural Health Clinic
0550 R. Habana Cuba M.... Breakthrough

ARTS AND CULTURE

0530 China R. Int. S..... In the Spotlight
Deutsche Welle W..... Arts on the Air
F..... Cool (Euro youth culture)

LOCAL LIVES AND VIEWS

0505 R. Australia A..... Australian Express (magazine)
0510 R. New Zealand Int. A..... A. Tagata o te Moana (Pacific magazine)
0529 BBCWS(waf) D..... African News
0530 China R. Int. M..... People in the Know
W..... China Horizons
H..... Voices from Other Lands
F..... Life in China
Deutsche Welle S..... Africa This Week
H..... Living in Germany
0532 BBCWS(eu) A..... People & Politics
BBCWS(waf) S..... African Perspective
M-F.. Network Africa
A..... African Quiz (1st A) [or]
..... This Week & Africa

INFORMATIONAL FEATURES

0505 Deutsche Welle S..... Religion & Society
R. Australia S..... All in the Mind (the brain)
0510 R. New Zealand Int. S..... Religion feature or series
0530 R. Australia S..... The Ark (religious history)
A..... All in the Mind (the brain)
0532 BBCWS(eu) S..... Reporting Religion
0545 Deutsche Welle H..... Europe in Capitals

MUSIC

0510 R. Japan S..... Pop Joins the World
0530 Deutsche Welle M..... Hits in Germany [or] Melody Time
T..... A World of Music
A..... Focus on Folk
WHRI (5745/7315) A..... World Harvest Country Style
0535 R. Australia A..... Fine Music Australia (classical)
0540 R. New Zealand Int. S..... Jazz Spotlight

ENTERTAINMENT

0500 WBCQ Maine S..... Juliet's Wild Kingdom
M..... Joe Mazza ("everything but politics")

SWL, MEDIA AND COMMUNICATIONS

0500 WHRI (5745, 7315) A..... DXing with Cumbre
WRMI (7385) S/M.. World Radio Network relay
0540 R. Habana Cuba S/W.. DXers Unlimited

Listener Contact/Interactive

0510 R. Japan A..... Hello from Tokyo
0530 China R. Int. A..... Listeners' Garden
0540 R. Habana Cuba M..... Mailbag Show

SPORT

0500 R. Australia S/A.. Grandstand (live action)*
0505 Deutsche Welle M..... Hard to Beat
0523 VOA Africa M-F.. Sports Report
0535 R. Habana Cuba T-A... Time Out
R. New Zealand Int. D..... D. Live Sport (as available)
(*special on 9660, 12080, 15240, 17750 kHz. only.)

0600 UTC/ 2am E/11pm P - Page 48 Freqs

NEWSCASTS (*extended)

0600 BBCWS(waf)(eu) D..... The World Today*
Deutsche Welle D..... News
R. Australia D..... News
R. Habana Cuba D..... News
R. Japan D..... News
R. New Zealand Int. D..... D. News
VOA Africa S/A.. News & Reports*

CURRENT AFFAIRS MAGAZINES/FEATURES

0600 VOA Africa M-F.. Daybreak Africa
0605 Deutsche Welle T-A... Newslink Africa
R. New Zealand Int. M-F..... Worldwatch & Pacific Report
0615 R. Japan M-F.. Asian Top News (region's radio)
0630 Deutsche Welle T..... Insight (international affairs)
0632 BBCWS(eu) S..... The Interview (trends)
0645 BBCWS(waf) S..... The Instant Guide (backgrounder)

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

0630 Deutsche Welle W..... World in Progress (development)
H..... Money Talks
0632 BBCWS(waf) S..... World Business Review
0645 Deutsche Welle T..... Business German

SCIENCE/TECHNOLOGY (incl. Health & Environment)

0605 R. Australia S..... The Buzz (technology)
0620 R. Australia M..... Ockham's Razor (opinion)
T..... In Conversation
0630 Deutsche Welle F..... Living Planet
R. Australia A..... Spectrum
A..... In Conversation

LOCAL LIVES AND VIEWS

0605 Deutsche Welle S..... Inside Europe
0607 R. New Zealand Int. S..... S. Mana Korero (Maori magazine)
0610 R. Japan S..... Weekend Japanology
0620 R. Australia F..... Inside Out (Pacific islanders)
0632 BBCWS(waf) M-F.. Network Africa
A..... African Quiz (1st A) [or]
..... This Week & Africa (exc. 1st A)
0633 VOA Africa S/A.. Main Street (life in the USA)
0654 R. Japan S..... Japan: Take Five

INFORMATIONAL FEATURES

0620 R. Australia W..... The Ark (religious history)
H..... Lingua Franca (language)
0625 R. Japan T..... Basic Japanese for You
H..... Brush Up Your Japanese
S..... World of Stamps

MUSIC

0605 WHRI (7315) A..... Turn Your Radio On (southern gospel)
0607 R. New Zealand Int. A..... The Mix
0610 R. Habana Cuba M..... From Havana (Cuban musicians)
R. Japan M-F.. Songs for Everyone
A..... Pop Joins the World
M..... Japan Musicscape
W..... Japan Music Travelogue

0630 R. Australia F..... Music Beat (pop)
S..... Hit Mix
A..... Oz Sounds
M..... The Jazz Place [or] Top Tens
0640 R. Australia M..... Hit Mix
T..... Music Deli (international)
W..... Jazz Notes
H..... Australia Country Style

ENTERTAINMENT

0600 WBCQ (7415) M..... Joe Mazza [cont'd]
0645 R. New Zealand Int. M-F..... Storytime (for children)

Listener Contact

0605 Deutsche Welle M..... Mailbag

SWL, MEDIA AND COMMUNICATIONS

0600 WRMI (7385) S/M.. World Radio Network relay
0630 WHRI (5745) S..... DXing with Cumbre
WWCR (3210) S..... World of Radio

SPORT

0600 R. Australia S/A.. Grandstand (live action)*
R. New Zealand Int. D..... D. Live Sport (as available)
0610 R. Australia M-F.. Regional Sports Report
0623 VOA Africa S/A.. Sports
0632 BBCWS(eu) A..... World Football
(*special on 9660, 12080, 15240, 17750 kHz. only.)

1000 UTC/6am E/3am P - Page 49 Freqs

NEWSCASTS (*extended)

1000 BBCWS(am) S/A.. News
M-F.. World Briefing*
R. Australia D..... News
R. New Zealand Int. D..... D. News

CURRENT AFFAIRS MAGAZINES/FEATURES

1005 R. Australia M-F.. Asia Pacific
R. New Zealand Int. M-F..... Late Edition
1006 BBCWS(am) S..... Love (anthropologist's view—1st/8th/15th)
..... Documentaries (22nd/29th)
A..... Assignment (one topic in-depth)
1010 WWCR (5070) S..... A View from Europe

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

1032 BBCWS(am) M-F.. World Business Report

SCIENCE/TECHNOLOGY (incl. Health & Environment)

1030 R. Australia M..... Health Report

LOCAL LIVES AND VIEWS

1005 R. Australia A..... Inside Out (Pacific islanders)
1035 R. New Zealand Int. S..... Sunday Supplement

INFORMATIONAL FEATURES

1030 R. Australia T..... Law Report
W..... Religion Report
1032 BBCWS(am) S..... In Praise of God

MUSIC

1000 WWCR (15825) M-F.. Worldwide Country Radio
1005 R. Australia S..... Keys to MUSIC
WHRI (9495) S..... Turn Your Radio On (southern gospel)
1012 R. New Zealand Int. A..... Deep Purple (relaxing)

SWL, MEDIA AND COMMUNICATIONS

1012 R. New Zealand Int. S..... Mediawatch
1030 R. Australia H..... Media Report
WWCR (5070) A..... World of Radio

LISTENER CONTACT/INTERACTIVE

1015 WWCR (15825) S..... Ask WWCR

SPORT

1030 R. Australia F..... Sports Factor
1032 BBCWS(am) A..... World Football
1045 BBCWS(am) M-F.. Sports Roundup

1100 UTC/ 7am E/4am P - Page 50 Freqs

NEWSCASTS (*extended)

1100 BBCWS(am) D..... World Briefing
R. Australia D..... News

Shortwave Guide



R. Japan D News
R. Netherlands S/A News
R. New Zealand Int. S/A News

CURRENT AFFAIRS MAGAZINES/FEATURES

1100 R. Netherlands D Newsline
1105 BBCWS(am) M-F. Caribbean Morning Report
1106 R. Australia M-A. Asia Pacific
R. Netherlands S Wide Angle (one issue in focus)
1108 R. New Zealand Int. M-F Dateline Pacific
1115 R. Japan M-F. Asian Top News (region's radio)
1130 R. New Zealand Int. F. Pacific Correspondent
1132 R. Sweden M-F. 60 Degrees North
BBCWS(am) S Letter (comment)
M The Instant Guide (background)
TWFA Analysis
H From Our Own Correspondent

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

1130 R. Netherlands F A Good Life (development issues)
R. New Zealand Int. W Tradewinds (Pacific commerce)

SCIENCE/TECHNOLOGY (incl. Health & Environment)

1130 R. Australia M Innovations
T Earthbeat
A All in the Mind (the brain)
1145 R. Netherlands M Research File
R. Sweden H Green Scan (environment)[2nd H]
Heart Beat (health)[3rd H]

ARTS AND CULTURE

1130 R. Netherlands S Vox Humana
R. Sweden A Spectrum [3rd A]

LOCAL LIVES AND VIEWS

1100 China R. Int. D Real Time Beijing
R. New Zealand Int. M-F Pacific Regional News
1105 R. Australia S Sunday Profile
R. New Zealand Int. S/A NZ Forces Radio
1106 R. Netherlands A Europe Unzipped
1110 WWCW (5070) A A View from Europe
1115 BBCWS(am) M-F. Caribbean Magazine
1120 BBCWS(am) D British News
1130 R. Australia S Speaking Out (Aboriginal views)
W Rural Reporter
F The Chat Room
T EuroQuest (Europe in context)
R. Netherlands H Dutch Horizons
R. Sweden A Network Europe [1st A]
Sweden Today [2nd A]
Studio 49 [4th A]
Close Up [2nd T]
1145 R. Sweden H Nordic Lights [1st H]
The S Files [4th H]
F Review of the Newsweek

INFORMATIONAL FEATURES

1125 R. Japan T Basic Japanese for You
H Brush Up Your Japanese
1130 R. Australia A All in the Mind (the brain)
R. Netherlands W Weekly Documentary

MUSIC

1110 R. Japan A Pop Joins the World
1115 China R. Int. S China Beat (pop)
A China Roots (traditional)
1125 R. Japan M Japan Musicscape
W Japan Music Travelogue
F Music Beat (pop)
1130 R. New Zealand Int. M. New Music Releases
R. Sweden S Sounds Nordic [exc. 1st A]

SWL, MEDIA AND COMMUNICATIONS

1130 R. New Zealand Int. T. RNZI Talk (station news)[fortnightly]

LISTENER CONTACT/INTERACTIVE

1110 R. Japan S Hello From Tokyo
1130 R. Netherlands A Amsterdam Forum (discussions)
R. New Zealand Int. T. Mailbox (letters/DX news)[fortnightly]
R. Sweden S In Touch with Stockholm [1st A]

SPORT

1105 R. New Zealand Int. F. Sports Story
1110 BBCWS(am) M-F. Caribbean Sport
1130 R. New Zealand Int. H. The World in Sport
1145 BBCWS(am) F Football Extra
A-H. Sports Roundup

1200 UTC/ 8am E/5am P - Page 50 Freqs

NEWSCASTS (*extended)

1200 BBCWS(am) D Newshour*
R. Australia D News
R. Canada Int. M-F. News
R. Korea Int. D News
R. New Zealand Int. D. News

CURRENT AFFAIRS MAGAZINES/FEATURES

1200 HCJB Ecuador M-F. Morning in the Mountains
1205 R. Canada Int. M-F. The Current
R. New Zealand Int. M-F Late Edition
1210 BBCWS(am) M-F. Caribbean Morning Report
R. Korea Int. M-F. News Commentary
1230 R. Sweden M-F. 60 Degrees North

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

1205 BBCWS(am) M-F. Caribbean Business

SCIENCE/TECHNOLOGY (incl. Health & Environment)

1245 R. Sweden H Green Scan (ecology-2nd H)
Heart Beat (3rd H)

ARTS AND CULTURE

1230 R. Sweden A Spectrum (3rd wk.)

LOCAL LIVES AND VIEWS

1205 R. Australia M-H Late Night Live (discussion)
R. New Zealand Int. A. NZ Forces Radio [cont'd]
1215 R. Korea Int. M-F. Seoul Calling
1230 R. Sweden A Network Europe (Europe magazine-1st A)
Sweden Today (2nd A)
Studio 49 (discussion-4th A)
1245 R. Korea Int. M Korea, Today & Tomorrow
T Korean Kaleidoscope (society)
W Wonderful Korea (travelogue)
H Seoul Report (interviews)
R. Sweden T Close-Up (profiles-1st T)
H Nordic Report (1st H)
The S-Files (things Swedish-4th H)
F Review of the Newsweek

INFORMATIONAL FEATURES

1205 R. Australia S The Spirit of Things (spiritual matters)

MUSIC

1205 R. Australia F Sound Quality (innovative)
A The Music Show
WHRI (9840) A Turn Your Radio On (southern gospel)
1210 R. Korea Int. S Korean Pop Interactive
1230 R. Sweden S Sounds Nordic (rock-exc. 1st S)

SWL, MEDIA AND COMMUNICATIONS

1200 WRMI (15725) A World Radio Network relay
1230 HCJB Ecuador A DX Partyline
WHRI (9495) A DXing with Cumbre

LISTENER CONTACT/INTERACTIVE

1210 R. Korea Int. A Worldwide Friendship
1230 R. Sweden S In Touch with Stockholm (1st S)

SPORT

1205 R. New Zealand Int. S. Sportsworld (weekend review)
1245 R. Sweden M Sport Scan

1300 UTC/ 9am E/6am P - Page 51 Freqs

NEWSCASTS

1300 BBCWS(am) D News
China R. Int. D News & Reports*
R. Australia D News
R. Canada Int. D News
R. Japan D News
R. New Zealand Int. D. News

R. Canada Int. D News
R. New Zealand Int. S/A News

CURRENT AFFAIRS MAGAZINES/FEATURES

1306 BBCWS(am) S From Our Own Correspondent
M-F. Outlook
1308 R. New Zealand Int. M-F Dateline Pacific
1310 China R. Int. S Report on Developing Countries
1330 R. New Zealand Int. H. Pacific Correspondent
1355 R. Australia S Perspective

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

1330 China R. Int. T Biz China
R. New Zealand Int. T. Tradewinds (Pacific commerce)

SCIENCE/TECHNOLOGY (incl. Health & Environment)

1315 China R. Int. A Cutting Edge

ARTS AND CULTURE

1330 China R. Int. S In the Spotlight

LOCAL LIVES AND VIEWS

1305 R. Canada Int. S The Summer Edition (interviews/documentaries)
M-F. Sounds Like Canada
A The House (Parliament)
R. New Zealand Int. S. Tagata o te Moana (Maori magazine)
1320 China R. Int. S CRI Roundup
1330 China R. Int. M People in the Know
W China Horizons
H Voices from Other Lands
F Life in China

INFORMATIONAL FEATURES

1305 R. Australia S Encounter (religious expression)
1332 BBCWS(am) S The Interview (trends)

MUSIC

1305 R. Australia M-F. The Planet (international)
A The Music Show [from 1205]
R. New Zealand Int. A. New Music Releases
VOA News Now S/A. Jazz America
M American Gold (oldies)
T Roots & Branches (folk)
W Classic Rock
H Top 20
F Country Hits
WWCR (15825) M-F. Worldwide Country Radio
1330 WHRA/WHRI S World Harvest Country Style

ENTERTAINMENT

1306 BBCWS(am) A Pick of the World (BBC's best)
1345 BBCWS(am) M-F. Off the Shelf (book readings)

SWL, MEDIA AND COMMUNICATIONS

1300 WRMI (15725) A World Radio Network relay
1330 R. New Zealand Int. M. RNZI Talk (station news)[fortnightly]

LISTENER CONTACT/INTERACTIVE

1330 China R. Int. A Listeners' Garden
R. New Zealand Int. M. Mailbox (letters/DX news)[fortnightly]
1345 BBCWS(am) A Write On

SPORT

1330 R. New Zealand Int. W. The World in Sport
F Sports Story

1400 UTC/ 10am E/7am P - Page 51 Freqs

NEWSCASTS (*extended)

1400 BBCWS(am) D News
China R. Int. D News & Reports*
R. Australia D News
R. Canada Int. D News
R. Japan D News
R. New Zealand Int. D. News

CURRENT AFFAIRS MAGAZINES/FEATURES

1405 R. Australia M-F. P.M.
A Background Briefing
1406 BBCWS(am) H Assignment (one topic in-depth)

Shortwave Guide



- 1410 China R. Int. S..... Report on Developing Countries
1415 R. Japan M-F. 44 Minutes

BUSINESS/ECONOMICS (also in **NEWSCASTS** & **Current Affairs**)
1410 China R. Int. T..... Biz China
1432 BBCWS(am) H..... The Music Biz

SCIENCE/TECHNOLOGY (incl. **Health & Environment**)
1405 R. Australia S..... The Science Show
1415 China R. Int. A..... Cutting Edge

ARTS AND CULTURE
1406 BBCWS(am) T..... Masterpiece (cultural ideas)
1430 China R. Int. S..... In the Spotlight

LOCAL LIVES AND VIEWS
1405 R. Canada Int. S..... The Summer Edition (from 1305)
M-F. Sounds Like Canada (from 1305)
1410 R. Japan A..... Weekend Japanology
1420 China R. Int. S..... CRI Roundup
1430 China R. Int. M..... People in the Know
W..... China Horizons
H..... Voices from Other Lands
F..... Life in China
R. Canada Int. F..... C'est la Vie (in French Canada)
1445 R. Canada Int. M-H Out Front ("first person" radio)
1454 R. Japan A..... Japan: Take Five

INFORMATIONAL FEATURES
1405 R. New Zealand Int. A..... Religion program or series
1406 BBCWS(am) M..... Documentaries
W..... Love (anthropologist's view—4th/11th)
..... Documentaries (18th/25th)

MUSIC
1405 R. Japan S..... Pop Joins the World
R. New Zealand Int. S..... In a Mellow Tone
M-F. Wayne's Music (decade by decade)
1432 BBCWS(am) M..... The Music Feature
T..... Top of the Pops (UK top 20)
W..... Charlie Gillett (world)
F..... John Peel (eclectic)

ENTERTAINMENT
1405 R. Canada Int. A..... Vinyl Cafe (music/humor)

SWL, MEDIA AND COMMUNICATIONS
1400 WRMI (15725) S/A.. World Radio Network relay

LISTENER CONTACT/INTERACTIVE
1406 BBCWS(am) S..... Talking Point (current events call-in)
1430 China R. Int. A..... Listeners' Garden

SPORT
1406 BBCWS(am) F..... Sports International (magazine)
BBCWS(am)(eas) A..... Sportsworld (live action)

1500 UTC/ 11am E/8am P - Page 52 Freqs

NEWSCASTS
1500 BBCWS(am) D..... News
China R. Int. D..... News
R. Australia D..... News
R. Canada Int. S/A.. News
R. Japan D..... News

CURRENT AFFAIRS MAGAZINES/FEATURES
1505 R. Australia M-F. Asia Pacific
1506 BBCWS(am) S..... Assignment (one topic in-depth)
1510 China R. Int. S..... Report on Developing Countries
1515 R. Japan M-F. Asian Top News

BUSINESS/ECONOMICS (also in **NEWSCASTS** & **Current Affairs**)
1530 China R. Int. T..... Biz China
1555 R. Australia A..... Business Weekend

SCIENCE/TECHNOLOGY (incl. **Health & Environment**)
1505 R. Canada Int. A..... Quirks and Quarks
1506 BBCWS(am) M..... Health Matters
T..... Go Digital (infotech)

W..... Discovery (research)
H..... One Planet (ecology)
F..... Science in Action (magazine)
A..... Cutting Edge
M..... The Health Report

ARTS AND CULTURE
1530 China R. Int. S..... In the Spotlight

LOCAL LIVES AND VIEWS
1505 R. Australia S..... The National Interest
R. Austria Int. S/A.. Insight Central Europe
R. Canada Int. S..... The Sunday Edition (from 1305)
1515 R. Austria Int. M-F. Report from Austria
1520 China R. Int. S..... CRI Roundup
1530 China R. Int. M..... People in the Know
W..... China Horizons
H..... Voices from Other Lands
F..... Life in China
S/A.. Insight Central Europe
M-F. Report from Austria

INFORMATIONAL FEATURES
1525 R. Japan T..... Basic Japanese for You
H..... Brush Up Your Japanese
T..... The Law Report
1530 R. Australia W..... The Religion Report
1532 BBCWS(am) S..... Love (anthropologist's view—1st/8th/15th)
..... Documentaries (22nd/29th)
H..... The Word (books, writers & readers)[exc. last H]
..... World Book Club (discussion)[last H]
W..... Heart & Soul (beliefs & values)
F..... What's the Problem? (advice)

MUSIC
1505 R. Japan A..... Pop Joins the World
1525 R. Japan M..... Japan Musicscape
W..... Japan Music Travelogue
F..... Music Beat (pop)
T..... Music Review (magazine)

ENTERTAINMENT
1532 BBCWS(am) M..... Inspiration (science quiz)
W/F Westway (drama serial)

SWL, MEDIA AND COMMUNICATIONS
1500 WHRI (13760) A..... DXing with Cumbre
WRMI (15725) S/A.. World Radio Network relay
1530 R. Australia H..... The Media Report
WHRI (15105) S..... DXing with Cumbre

LISTENER CONTACT/INTERACTIVE
1505 R. Japan S..... Hello from Tokyo
1525 R. Austria Int. S/A.. Listener Letters
1530 China R. Int. A..... Listeners' Garden
1555 R. Austria Int. S/A.. Listener Letters

SPORT
1505 BBCWS(am) A..... Sportsworld (from 1405)
1530 R. Australia F..... The Sports Factor

1600 UTC/ 12pm E/9am P - Page 52 Freqs

NEWSCASTS (*extended)
1600 BBCWS(am) S/A.. News
Deutsche Welle D..... News
R. Australia D..... News
VOA Africa M-F. News & Reports*

CURRENT AFFAIRS MAGAZINES/FEATURES
1600 BBCWS(am) M-F. Europe Today
VOA Africa S/A.. Nightline Africa
1605 Deutsche Welle M-F. Newslink Asia
1615 VOA Africa M-F. Focus (a topic in depth)
1630 Deutsche Welle M..... Insight (international)
VOA Africa M-F. Africa World Tonight

BUSINESS/ECONOMICS (also in **News & Current Affairs**)
1630 Deutsche Welle T..... World in Progress (development)
W..... Money Talks

SCIENCE/TECHNOLOGY (incl. **Health & Environment**)
1630 Deutsche Welle H..... Living Planet

ARTS AND CULTURE
1605 R. Australia S..... Books & Writing
1630 Deutsche Welle A..... Cool! (youth culture)
1635 R. Australia S..... Book Talk

LOCAL LIVES AND VIEWS
1605 R. Australia A..... Hindsight (social history)
1630 Deutsche Welle F..... Asia This Week
1645 Deutsche Welle M..... Europe in Capitals (city profile)

INFORMATIONAL FEATURES
1600 WWCR (15725) S..... Latin Catholic Mass

MUSIC
1600 Voice of Greece A..... Hellenes Around the World
WRMI Florida S..... Solid Rock Radio (from 1400)
WWCR (15825) M-F. Worldwide Country Radio

ENTERTAINMENT Feature
1605 R. Australia M-F. Margaret Throsby (interview/music)

SWL, MEDIA AND COMMUNICATIONS
1600 KWHR Hawaii(930) A..... DXing with Cumbre
WRMI (15725) A..... World Radio Network (relay)

LISTENER CONTACT/INTERACTIVE
1600 WBCQ (17495) A..... Allan Weiner Worldwide
1605 Deutsche Welle S..... Mailbag

SPORT
1600 WHRI (15105) A..... Sports Spectrum Live
1605 BBCWS(am) S/A.. Sportsworld (live action)
Deutsche Welle A..... Hard to Beat
1623 VOA Africa M-F. Sports

1700 UTC/ 1pm E/10am P - Page 53 Freqs

NEWSCASTS (*extended)
1700 R. Australia D..... News
R. Japan D..... News
VOA Africa M-A. News

CURRENT AFFAIRS MAGAZINES/FEATURES
1715 R. Japan M-F. 44 Minutes

LOCAL LIVES AND VIEWS
1705 R. Australia M-F. Australia Talks Back (phone-in)
1710 WWCR (12160) S..... A View from Europe

INFORMATIONAL FEATURES
1705 R. Australia A..... The Spirit of Things (spiritual matters)

MUSIC
1700 WBCQ (17495) A..... Zombo's Mondo Record Party
1705 R. Australia S..... Sound Quality (innovative)
1710 R. Japan S..... Pop Joins the World
1730 VOA Africa S..... Music Time in Africa

SWL, MEDIA AND COMMUNICATIONS
1700 WRMI (15725) S/A.. World Radio Network relay

LISTENER CONTACT/INTERACTIVE
1706 VOA Africa M-F. Talk to America (listener phone-in)
1710 R. Japan A..... Hello from Tokyo
1715 WWCR (15825) W..... Ask WWCR (exc. 2nd/3rd wk)
1730 WWCR (12160) S..... Ask WWCR

2100 UTC/ 5pm E/2pm P - Page 55 Freqs

NEWSCASTS (*extended)
2100 BBCWS(am) D..... News
Deutsche Welle D..... News
R. Australia D..... News
R. Canada Int. M-F. The World at Six*
S/A.. News
R. Japan D..... News

CURRENT AFFAIRS MAGAZINES/FEATURES
2105 Deutsche Welle M-F. Newslink Africa
2110 R. Australia S-H.. AM (morning news magazine)
2115 R. Japan M-F. Asian Top News (region's radio)
2130 R. Australia S-H.. RNZI Pacific Dateline (rebroadcast)
R. Canada Int. M-F. As It Happens (interviews)
2145 R. Australia A..... Asia Sunday

Shortwave Guide



SCIENCE/TECHNOLOGY (incl. Health & Environment)

- 2106 BBCWS(am) M Health Matters
T Go Digital (infotech)
W Discovery (research)
H One Planet (ecology)
F Science in Action (magazine)
2130 R. Australia F In Conversation

ARTS AND CULTURE

- 2130 Deutsche Welle T Arts on the Air (magazine)

LOCAL LIVES AND VIEWS

- 2105 R. Australia F Verbatim (oral history)
A Australia All Over
2110 R. Japan A Weekend Japanology
2115 BBCWS(am) M-F. Caribbean Report*
2120 BBCWS(am) M-F. British News
2130 BBCWS(am) T/F .. Calling the Falklands ^
Deutsche Welle W Living in Germany
A Africa This Week
2145 Deutsche Welle W Europe in Capitals
2154 R. Japan A Japan: Take Five
(*special service on 5975, 11675, 15390 kHz. only.)
(^special service on 11680 kHz.)

INFORMATIONAL FEATURES

- 2105 Deutsche Welle A Religion & Society
WHRI (5745) M-H For the People (populism)
2115 Deutsche Welle S Inspired Minds
R. Japan A German by Radio
T Basic Japanese for You
2130 Deutsche Welle H Brush Up Your Japanese
H Cool! (Euro youth culture)
2132 BBCWS(am) H The Word (books, readers, writers) [exc last H]
..... World Book Club (discussion)[last H]
2145 BBCWS(am) W Heart & Soul (beliefs/values)
F What's the Problem? (advice)

MUSIC

- 2100 WBCQ (5105) M-F. Radio Caroline
2105 R. Japan S Pop Joins the World
VOA News Now M American Gold (oldies)
T Roots & Branches (folk)
W Classic Rock
H Top 20
2125 R. Japan F Country Hits
M Japan Musicscape
W Japan Music Travelogue
F Music Beat (pop)
2130 Deutsche Welle S Hits in Germany [or]
..... Melody Time
M A World of MUSIC
2132 BBCWS(am) F Focus on Folk
T Music Review (magazine)

ENTERTAINMENT

- 2100 R. Canada Int. A Definitely Not the Opera (pop culture)
WBCQ Maine(7415) S .. Radio Free Euphoria/Radio Three
M Jean Shepherd
H Planet World News (satire)
F Frankie V Radio Show
2101 BBCWS(am) A Play of the Week (radio theatre)
2130 WBCQ Maine(7415) F .. The Pab Sungenis Project
2132 BBCWS(am) M Inspiration (science quiz)
W/F Westway (drama serial)

SWL, MEDIA AND COMMUNICATIONS

- 2100 WHRA (17650) F DXing with Cumbre
WHRI (5745) S DXing with Cumbre
WRMI (15725) S Wavescan
A World Radio Network relay
2130 WHRI (9495) A DXing with Cumbre
WRMI (15725) A Voice of the NASB

LISTENER CONTACT/INTERACTIVE

- 2100 R. Canada Int. S Cross Country Checkup
WBCQ (9330) A Allan Weiner Worldwide

2200 UTC/ 6pm E/3pm P - Page 56 Freqs

NEWSCASTS (*extended)

- 2200 BBCWS(am) D The World Today*
R. Australia D News
R. Canada Int. M-F. The World at Six*

- RVi Belgium
Voice of Turkey
2230 R. Prague

CURRENT AFFAIRS MAGAZINES/FEATURES

- 2200 R. Canada Int. S/A .. The World This Weekend
2205 R. Australia F Asia Pacific
A Correspondents Report
D Press Review
2210 Voice of Turkey S-H .. AM (morning news magazine)
2230 R. Australia F AM Saturday
R. Canada Int. M-F. As It Happens (interviews)

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

- 2245 R. Prague H Business Report

ARTS AND CULTURE

- 2235 Voice of Turkey H Culture Parade
A Turkish Arts
2240 R. Prague F The Arts
2245 R. Prague S Czech Books (fortnightly)
F Stepping Out (Prague nightlife)

LOCAL LIVES AND VIEWS

- 2204 RVi Belgium M-F. Flanders Today
2208 RVi Belgium S Tourism in Flanders
2210 Voice of Turkey F Archaeological Settlements
2232 BBCWS(am) F People & Politics
2235 R. Prague S ABC of Czech (language)
M-F. Current Affairs
2240 R. Australia A Insight Central Europe
S-H .. Australia Wide (national report)
2245 R. Prague M Talking Point (Czech issues)
T/A .. One on One (interview)
W Czechs in History [or]
..... Czechs Today [or]
Spotlight (places)

INFORMATIONAL FEATURES

- 2232 BBCWS(am) A The Interview

MUSIC

- 2200 RVi Belgium A Music from Flanders
2205 WHRI (5745) A Turn Your Radio On (southern gospel)
2210 Voice of Turkey S Tunes Spanning Centuries
2230 R. Australia A Music Deli (international)
WBCQ (7415) W The Music Download
Scene
H Uncle Ed's Musical Memories
F WDCC
2245 R. Prague S Encore (classical) [or]
..... Magic Carpet (world) [both monthly]

ENTERTAINMENT

- 2200 WBCQ (5105) S Jean Shepherd
WBCQ (7415) M Radio Weather
F Pab Sungenis Project
A Radio Timtron Worldwide
2230 R. Canada Int. A Madly Off in All Directions (comedy)

SWL, MEDIA AND COMMUNICATIONS

- 2200 RVi Belgium S Radio World
WBCQ (17495) W World of Radio
2220 Voice of Turkey F DX Corner (fortnightly)
2245 R. Canada Int. S CIDX Report (fortnightly)

LISTENER CONTACT/INTERACTIVE

- 2215 Voice of Turkey T Live from Turkey
2216 RVi Belgium S Brussels 1043
2220 Voice of Turkey W Letterbox
2230 R. Canada Int. S Maple Leaf Mailbag
2235 R. Prague S Mailbox

2300 UTC/ 7pm E/4pm P - Page 56 Freqs

NEWSCASTS (*extended)

- 2300 BBCWS(am) D News
China R. Int. D News & Reports*
R. Australia D News
R. Canada Int. D News

CURRENT AFFAIRS MAGAZINES/FEATURES

- 2305 R. Canada Int. M-F. As It Happens (from 2300)
2306 BBCWS(am) M-F. Outlook
2310 China R. Int. A Report on Developing

- R. Australia S-H .. Asia Pacific
R. Canada Int. W Dispatches (international)

BUSINESS/ECONOMICS (also in NEWSCASTS & Current Affairs)

- 2330 China R. Int. M Biz China

SCIENCE/TECHNOLOGY (incl. Health & Environment)

- 2315 China R. Int. F Cutting Edge
2330 R. Australia H The Buzz (infotech)
A Innovations

ARTS AND CULTURE

- 2305 R. Canada Int. A Writers & Co.
2330 China R. Int. A In the Spotlight
R. Australia W The Arts

LOCAL LIVES AND VIEWS

- 2305 R. Australia F Country Breakfast (rural stories)
2320 China R. Int. S CRI Roundup
2330 China R. Int. S People in the Know
T China Horizons
W Voices from Other Lands
H Life in China
S Verbatim (oral history)
T Rural Reporter

INFORMATIONAL FEATURES

- 2305 WHRA (7580) M-F. For the People (populism)
2306 BBCWS(am) S Documentaris
2330 R. Australia M The Europeans
MUSIC
2300 WBCQ (7415) H Goddess Irene I Music Show
2305 R. Canada Int. F Lost Discs Radio Show
S Global Village (world/folk)
WHRA (7580) S Turn Your Radio On (southern gospel)
2330 WBCQ (7415) A Fred Flintstone Music Show
WHRI (5745) A World Harvest Country Style

ENTERTAINMENT

- 2300 WBCQ (5105) S Best of Complex Variables Studio
WBCQ (7415) S Le Show
2306 BBCWS(am) A Pick of the World (BBC's best)
2330 WBCQ (7415) T Duhh News
2332 BBCWS(am) S Inspiration (science quiz)
2345 BBCWS(am) M-F. Off the Shelf (readings)

SWL, MEDIA AND COMMUNICATIONS

- 2300 WBCQ (7415) W Off the Hook (public telecom issues)
A Real Amateur Radio Show
2330 WHRI (9495) A DXing with Cumbre

LISTENER CONTACT/INTERACTIVE

- 2330 China R. Int. F Listeners' Garden
2345 BBCWS(am) A Write On
WWCR (5070) A Ask WWCR

Thank You ...

Additional Contributors to This Month's Shortwave Guide:

Rich D'Angelo, *NASWA Flash Sheet*; Bob Fraser, Belfast, ME; *DX Listening Digest*, Anker Petersen, *DX Window*; ODXA/ DX Ontario; Michael Murray, UK; Prime Time SW, Larry Van Horn N5FPW, MT Asst. Editor; Loyd Van Horn W4LVH, Sylva, NC; *BCL News*; *Cumbre DX*; *Hard Core DX*; *NASWA Journal*.

If you collect frequency information on the Department of Defense (DoD) UHF military aircraft band frequencies long enough, you will begin to notice some interesting patterns and sub-bands. In some respects the bands remind me of a quilt the way it is patched together.

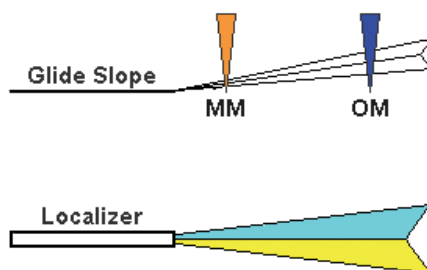
For instance, it is common knowledge that most of the UHF military satellite downlink activity occurs in the 240-270 MHz range. This is not an exclusive assignment, and you will find that the majority of the activity in this band is terrestrial based AM mode aeronautical communications.

Another sub-band you will find interesting is 328.6 (not 329.0 as indicated in most lists) to 335.0 MHz (150 kHz channeling) for Glide Slope navigation systems (see table one). When pilots fly using the Instrument Landing System (ILS), they are really following two signals: a localizer for lateral guidance (VHF); and a glide slope for vertical guidance (UHF). When they tune their Nav (Navigation) receiver to a localizer frequency, a second receiver, the glide-slope receiver, is automatically tuned to its proper frequency. The pairing is automatic.

The primary component of the ILS is the localizer, which provides lateral guidance. The localizer is a VHF radio transmitter and antenna system using the same general range as VOR transmitters (between 108.10 MHz and 111.95 MHz). Localizer frequencies, however, are only on odd-tenths, with 50 kHz spacing between each frequency. The transmitter and antenna are on the centerline at the opposite end of the runway from the approach threshold. It is similar to a VOR signal except that it provides radial information for only a single course; the runway heading. Localizer information is displayed on the same indicator used for VOR information.

The signal transmitted by the localizer consists of two vertical fan-shaped patterns that overlap, at the center. They are aligned with the extended centerline of the runway. The right side of this pattern, as seen by an approaching aircraft, is modulated at 150 Hz and is called the "blue" area. The left side of the pattern is modulated at 90 Hz and is called the "yellow" area. The overlap between the two areas provides the on-track signal.

The width of the navigational beam may be varied from approximately 3° to 6°, with 5° being normal. It is adjusted to provide a track signal approximately 700 ft wide at the runway threshold. The width of the beam increases so that at 10 NM from the transmitter, the beam is approximately one mile wide.



The glide slope provides vertical guidance to the pilot during the approach. The ILS glide slope is produced by a ground-based UHF radio transmitter and antenna system. The transmitter is located 750 to 1,250 feet (ft) down the runway from the threshold, offset 400 to 600 ft from the runway centerline. Monitored to a tolerance of $\pm 1/2$ degree, the UHF glide path is “paired” with (and usually automatically tuned by selecting) a corresponding VHF localizer frequency.

Like the localizer, the glide slope signal consists of two overlapping beams modulated at 90 Hz and 150 Hz. Unlike the localizer, however, these signals are aligned above each other and are radiated primarily along the approach track. The thickness of the overlap area is 1.4° or $.7^\circ$ above and $.7^\circ$ below the optimum glide slope.

The Glide Slope sub-band is suppose to be an exclusive assignment (no voice communica-

tions allowed). But longtime military air radio enthusiasts know that voice activity regularly takes place in this tiny portion of the spectrum.

Here is a list of some of the known frequencies that have been used for voice activity in this navigation sub-band:

329.000 USMC Camp Pendleton/Pendleton
MCAS: CA HMLA-775 Squadron Common
329.525 DoD Southeast US: Unknown user/
usage

330.125 USAF Eglin AFB FL 33 FW: unknown
usage

333.000 USMC Miramar MCAS CA: VMGR-352 Air-to-Air

333.150 DoD Southeast US: Unknown user/
usage

333.250 USMC Miramar MCAS CA: VMFAT-101 (FRS) Air-to-Air

333.300 USMC Miramar MCAS CA: VMFAT-101 (FRS) Air-to-Air

333.300 CanForce Nationwide CAN: Snowbirds Aero Demo Team Air-to-Air

333.300 USN Jacksonville NAS (Towers Field)
FL: TAW-1/2 Air-to-Air

333.300 USAF Otis ANGB/Cape Cod CGAS
MA: 102FW/101FS Air-to-Air

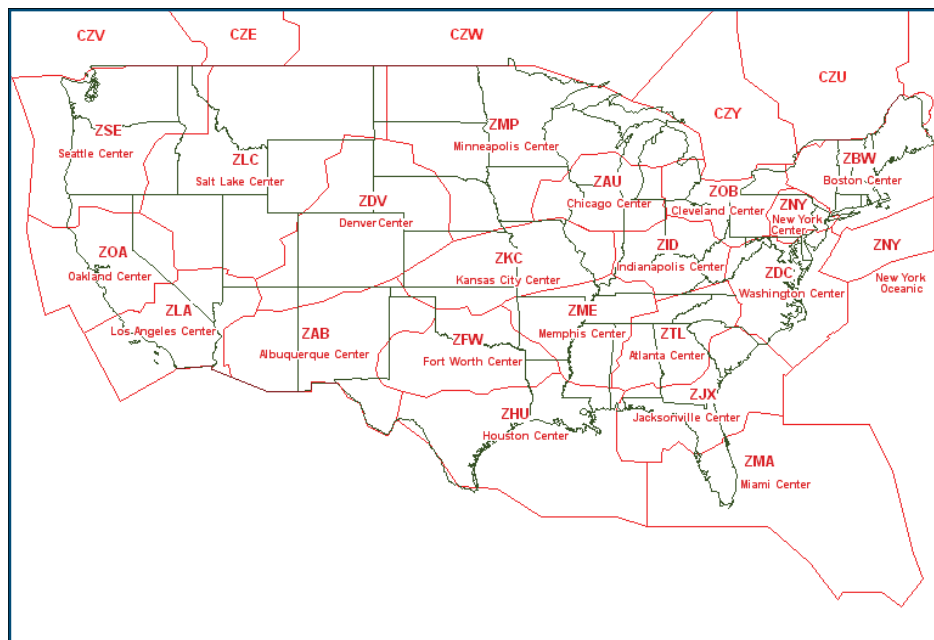
333.300 USN Brunswick NAS ME: VP-92 Air-to-Air

333.300 USMC Cherry Point MCAS: NC Harrier Training

333.300 USMC Beaufort MCAS (Merritt Field)
SC: VMFA-122 Air-to-Air

**333.300 USN: Nationwide F/A-18 Air-to-Air/
Flight Demo**

333.300 USAF: Nationwide Reported Common Air-to-Air



333.300 USN: West Coast US Aerial Refueling Carrier Air Refueling Operations
 333.300 USN/USMC: West Coast US USN/USMC Air-to-Air Common
 333.300 USN: Whidbey Island NAS WA VAQ-129 Air-to-Air
 333.350 USAF Tyndall AFB: FL Air-to-Air
 333.400 USMC Miramar MCAS CA: VMFA-323 Air-to-Air
 333.550 USAF Eglin AFB FL: 33FW Air-to-Air
 333.550 USAF Otis ANGB/Cape Cod CGAS MA: 102FW/101FS Air-to-Air
 333.550 USAF Nellis AFB NV: Unknown user air-to-air
 333.550 USAF: Nationwide Air-to-Air [Known as the Full House frequency]
 333.550 USAF Langley AFB: VA 1FW/71FS Air-to-Air
 333.650 USMC Miramar MCAS CA: VMFAT-101 (FRS) Air-to-Air
 333.650 USN: West Coast US Aerial Refueling Carrier Air Refueling Operations

That is quite a bit of voice activity in a sub-band that is supposed to be dedicated to a navigation and safety system only.

Like the sub-bands above used for a particular type of communications medium, there are other division with the military aircraft band. Each of the primary users of the 225-400 MHz spectrum have their own individual frequency assignments and band segments. The primary users of the 225-400 MHz band include the U.S. Air Force, U.S. Army, U.S. Coast Guard, US Navy (Marine Corps gets assignment under the Navy umbrella), NASA, Department of Energy, Immigration and Customs Enforcement, several other minor agencies, and the Federal Aviation Administration.

As regular readers of this column are probably aware, the military is rapidly bringing online 25 kHz spacing in the milair spectrum. Not a day goes by here at MT headquarters that I don't add an activity indicator and usage to one of the .x25/.x50/.x75 kHz spaced frequencies.

The FAA is also slowly making the change to 25 kHz in their assigned frequency blocks. In table two below we have provide the individual discrete and block of frequencies used by the FAA for air traffic control and by their Air Route Traffic Control Centers (ARTCC) nationwide. In table three we have indicated any spectrum holes within those blocks that should be watched for possible new FAA activity within the band. As always, we hope that readers of this column will report any activity on the spectrum holes noted in table three.

That just about does it for this month. Until next time, 73 and good hunting all.

Table One: Glide Slope Frequencies/Channels

| ILS Localizer | Glide Slope | Channel No |
|---------------|-------------|------------|
| 108.950 | 329.150 | 26Y |
| 108.900 | 329.300 | 26X |
| 110.550 | 329.450 | 42Y |
| 110.500 | 329.600 | 42X |
| 108.550 | 329.750 | 22Y |
| 108.500 | 329.900 | 22X |
| 110.750 | 330.050 | 44Y |
| 110.700 | 330.200 | 44X |
| 108.750 | 330.350 | 24Y |
| 108.700 | 330.500 | 24X |
| 110.950 | 330.650 | 46Y |
| 110.900 | 330.800 | 46X |
| 111.950 | 330.950 | 56Y |

| | | |
|---------|---------|-----|
| 111.900 | 331.100 | 56X |
| 109.150 | 331.250 | 28Y |
| 109.100 | 331.400 | 28X |
| 111.150 | 331.550 | 48Y |
| 111.100 | 331.700 | 48X |
| 109.350 | 331.850 | 30Y |
| 109.300 | 332.000 | 30X |
| 111.350 | 332.150 | 50Y |
| 111.300 | 332.300 | 50X |
| 109.550 | 332.450 | 32Y |
| 109.500 | 332.600 | 32X |
| 111.550 | 332.750 | 52Y |
| 111.500 | 332.900 | 52X |
| 109.750 | 333.050 | 34Y |
| 109.700 | 333.200 | 34X |
| 111.750 | 333.350 | 54Y |
| 111.700 | 333.500 | 54X |
| 109.950 | 333.650 | 36Y |
| 109.900 | 333.800 | 36X |
| 108.350 | 333.950 | 20Y |
| 108.300 | 334.100 | 20X |
| 110.150 | 334.250 | 38Y |
| 110.100 | 334.400 | 38X |
| 108.150 | 334.550 | 18Y |
| 108.100 | 334.700 | 18X |
| 110.350 | 334.850 | 40Y |
| 110.300 | 335.000 | 40X |

Table Two: FAA ARTCC/ATC Discrete and Frequency Block Assignments

| Discrete Frequencies with FAA Allocations | | | |
|---|-------------------------------------|-------------------------------------|-------------------------|
| 225.400 | 225.625 | 225.700 | 226.300 |
| 226.400 | 226.800 | 227.400 | 227.800 |
| 228.400 | 228.500 | 229.400 | 229.500 |
| 231.100 | 231.600 | 232.400 | 233.100 |
| 233.700 | 234.200 | 236.100 | 236.500 |
| 236.600 | 236.700 | 236.800 | 239.725 |
| 246.000 | 246.500 | 247.200 | 248.200 |
| 249.900 | 250.200 | 252.700 | 252.900 |
| 253.500 | 254.050 | 254.450 | 255.600 |
| 255.900 | 257.000 | 257.200 | 257.300 |
| 258.100 | 258.300 | 258.400 | 259.100 |
| 259.200 | 259.300 | 260.050 | 260.600 |
| 261.500 | 263.600 | 264.200 | 264.700 |
| 265.100 | 265.700 | 266.800 | 267.200 |
| 267.300 | 267.900 | 268.700 | 269.900 |
| 270.000 | 270.100 | 270.600 | 270.925 |
| 271.200 | 271.300 | 274.600 | 275.150 |
| 275.300 | 275.400 | 275.700 | 276.000 |
| 276.300 | 276.400 | 277.200 | 277.400 |
| 277.800 | 278.100 | 278.300 | 278.500 |
| 278.550 | 278.800 | 279.200 | 279.900 |
| 280.100 | 281.300 | 281.800 | 282.100 |
| 283.600 | 284.000 | 284.800 | 286.000 |
| 286.600 | 287.100 | 289.100 | 289.200 |
| 289.400 | 289.600 | 290.700 | 290.800 |
| 290.900 | 291.000 | 291.900 | 292.100 |
| 294.500 | 294.700 | 294.900 | 295.000 |
| 295.700 | 295.900 | 296.000 | 296.600 |
| 297.200 | 297.400 | 299.200 | 299.600 |
| 299.700 | 300.400 | 300.600 | 301.400 |
| 301.500 | 304.800 | 305.200 | 305.400 |
| 307.700 | 307.800 | 307.900 | 308.400 |
| 308.600 | 308.700 | 309.800 | 310.800 |
| 312.000 | 312.200 | 314.000 | 314.200 |
| 314.600 | 315.600 | 316.700 | 318.100 |
| 318.200 | 318.800 | 319.500 (One ARTCC assignment only) | 320.100 320.400 321.100 |
| 321.200 | 321.400 | 321.500 | 322.000 |
| 322.100 | 322.700 | 324.100 | 324.300 |
| 325.800 | 326.200 | 327.500 | 327.800 |
| 335.800 | 336.200 | 336.400 | 337.400 |
| 339.100 | 339.800 | 340.700 | 340.900 |
| 341.700 | 343.500 (One ARTCC assignment only) | 344.800 346.600 346.800 | 347.800 |
| 348.300 | 349.000 | 350.800 | 351.700 |
| 352.800 | 357.100 | 357.400 | 357.600 |
| 359.000 | 360.075 | 362.600 | 363.800 |
| 364.000 | 367.200 | 367.600 | 367.700 |
| 369.200 | 371.100 | 371.800 | 373.000 |
| 373.400 | 374.800 | 377.650 | 378.100 |
| 379.600 | 379.800 | 380.600 | 381.200 |

| | | | |
|---------|---------|---------|---------|
| 382.000 | 384.600 | 384.900 | 385.800 |
| 386.650 | 386.800 | 388.000 | 388.200 |
| 388.800 | 389.600 | 389.700 | 390.800 |
| 390.900 | 391.100 | 391.200 | 391.900 |
| 392.100 | 393.000 | 393.100 | 394.100 |
| 395.800 | 396.000 | 396.100 | 397.200 |
| 398.200 | 399.100 | 399.600 | |

FAA Frequency Block Assignments (Spacing 25 kHz, AM mode)

| | |
|-----------------|-----------------|
| 239.000-239.050 | 239.250-239.350 |
| 251.050-251.150 | 254.250-254.400 |
| 256.700-256.900 | 257.600-257.975 |
| 263.000-263.150 | 269.000-269.675 |
| 270.250-270.350 | 272.700-272.750 |
| 273.450-273.600 | 279.500-279.650 |
| 281.400-281.550 | 282.200-282.375 |
| 284.600-284.700 | 285.200-285.225 |
| 285.400-285.650 | 287.850-287.950 |
| 288.050-288.150 | 288.250-288.350 |
| 290.200-290.550 | 291.600-291.775 |
| 298.850-298.950 | 306.100-306.300 |
| 306.900-307.350 | 316.050-316.150 |
| 317.400-317.800 | 319.000-319.250 |
| 319.800-319.900 | 322.300-322.550 |
| 323.000-323.300 | 325.150-325.200 |
| 327.000-327.150 | 335.500-335.650 |
| 338.200-338.350 | 343.600-343.950 |
| 346.250-346.400 | 348.600-348.750 |
| 350.200-350.350 | 351.800-352.000 |
| 353.500-354.150 | 360.600-360.850 |
| 362.300-362.350 | 363.000-363.250 |
| 370.850-370.950 | 371.850-372.100 |
| 377.050-377.200 | 379.100-379.300 |
| 379.850-380.350 | 381.400-381.650 |
| 385.400-385.650 | 387.000-387.150 |
| 397.850-397.900 | 398.850-399.000 |

FAA Nationwide Allocations

255.400 Flight Service Stations Nationwide
 257.800 Civilian Airport Towers Nationwide
 263.000 FAA/NORAD ARTCC Discrete <Amber-7>
 273.500 FAA/USAF Automatic Terminal Information Service (ATIS) Nationwide
 275.800 FAA/USAF Ground Control and/or Clearance Delivery Nationwide
 296.700 FAA/NORAD ARTCC Discrete <Amber-4>
 321.300 FAA/NORAD ARTCC Discrete <Amber-6>
 348.600 Civilian Airport Ground Control and/or Clearance Delivery Nationwide
 364.800 FAA/NORAD ARTCC Discrete <Amber-3>
 369.900 FAA/NORAD ARTCC Discrete <Amber-5>

Table Three: FAA Frequency Block Spectrum Holes

| | | | |
|---------|---------|---------|---------|
| 239.325 | 256.750 | 256.825 | 269.025 |
| 269.625 | 269.675 | 279.525 | 287.875 |
| 287.925 | 288.075 | 288.125 | 306.125 |
| 306.150 | 306.225 | 306.275 | 307.075 |
| 307.125 | 307.175 | 307.225 | 316.075 |
| 317.675 | 319.025 | 319.075 | 319.125 |
| 319.175 | 319.225 | 319.825 | 319.875 |
| 322.425 | 323.025 | 323.225 | 323.275 |
| 325.175 | 338.325 | 343.625 | 343.675 |
| 343.825 | 343.875 | 343.925 | 346.275 |
| 346.325 | 346.375 | 348.625 | 350.225 |
| 350.250 | 350.275 | 351.875 | 351.925 |
| 351.975 | 353.625 | 353.675 | 353.775 |
| 353.825 | 353.875 | 353.925 | 353.975 |
| 354.075 | 354.125 | 360.725 | 360.775 |
| 360.825 | 362.325 | 363.075 | 363.175 |
| 363.225 | 371.925 | 371.975 | 372.025 |
| 372.050 | 372.075 | 377.075 | 379.125 |
| 379.175 | 379.225 | 379.275 | 379.875 |
| 379.975 | 380.075 | 380.125 | 380.175 |
| 380.275 | 380.325 | 381.425 | 381.475 |
| 381.525 | 381.575 | 381.625 | 385.475 |
| 385.525 | 385.575 | 385.625 | 387.075 |
| 387.125 | 398.875 | 398.925 | 398.975 |

Radio Modernizes the Rails

The railroads have gone through great changes in the past fifty years with respect to using radios to improve their operations. Gone are the days that the railroads used whistle and hand signals for their switching movements.

The advent of VHF (very high frequency) and also that of UHF (ultra high frequency) radio channels has catapulted railroad communications into the future. The use of solid state radios has also ensured that railroad radio communications are more reliable, and the radios are smaller than in previous years.

◆ Uses of the radio

Railroads use the radio for many purposes. For example, railroads have replaced the cabooses with an EOT (end of train) device radioing the status of the brake line air pressure to the engineer in the lead locomotive. Railroads are now required to use the radio controlled EOT to dump the air pressure from the rear of the trains for better braking.

Road and dispatcher channels are used daily on many railroads. The railroads use the road channel to talk to other trains and to roadside crews working on the right-of-way. A few railroads have a separate channel (i.e. CSX) for giving verbal train orders to the crews out on the high iron. The use of the dispatcher channel reduces the chatter on the road channel for safer communications.

These channels are typically recorded for safety reasons in case of a derailment or collision. The instructions given by the dispatcher to the train crews are recorded. So are the communications by the train crews for repeating trackside signals. These taped conversations are reviewed if an accident occurs.

The road channel normally has the "talking defect detectors" like the hotbox and dragging equipment detectors. The use of a separate dispatching channel keeps the road channel free for the important messages from detectors with respect to the safe operating status of the train.

◆ Yard and Switching Channels

Many railroads have one or more yard channels. They may also have separate switching channels for individual crew use. The trains will typically switch to the yard channel when entering the yard limits of a rail yard. The yard is normally run by a Yardmaster who directs the trains within the yard limits.

Larger railroads may have separate switching channels within the yards. These switching channels permit uninterrupted communications

between various switching crews within the yard.

Smaller railroads, such as switching roads, may use a different radio frequency for each switch crew on the railroad. These channels may be used in lieu of road, dispatcher and yard channels.

The Norfolk Southern has a terminal frequency controlling the rail traffic in the district surrounding the East Wayne Yard in New Haven, Indiana. The CSX also has such terminal channels in Cincinnati and Atlanta, as well, as other large rail terminals.

◆ Hump Yards

Hump yards are where cars are routed over a "hill" and then allowed to roll down the hill. The freight cars are meanwhile routed into the proper classification tracks to build a train. The hump jobs may have one or two hump channels for the exclusive use of the hump conductors for instructing the engineers on the locomotives pushing the cars over the hump.

A large classification yard has pulldown channels for the switching crews, which pull the strings of classified cars and assemble them into trains, or "consists." These crews will pull down the freight cars from the classification tracks and make up the trains and set them on the departure tracks. These crews will connect the airbrake hoses and ready the trains for departure.

The arrival yard may also have separate radio frequencies for the crews to "release or dump" the air from the airbrake lines and ready the trains for the hump.

There is a multitude of uses for radios in a railroad yard.

◆ Car Toads!

The people who service the freight cars in a railroad yard are typically called car toads, car knockers, or car men. The old Grand Trunk Western Railroad called their car department employees toads, or car toads. I used to know the head toad many years ago. His name was Carmen Hamilton and he played Santa Claus for the GTW Santa Train each year. His son carried on this tradition of being both car toad and Santa.

Many times the car department channel for the car men, or toads, uses a repeater radio system. Each car man carries a small handy-talkie radio with low power because the yard may cover quite an expanse. Thus, the radios, having a short transmitting range, often send their signals to a tall receiving antenna located mid-yard. A higher powered transmitter repeats the low power signal. The repeaters use one frequency for the handy-talkie transmission and another frequency for the re-

peater to transmit. Programming both of these channels is not usually necessary. I would recommend to program in the high-powered repeater output channel. You should catch all the action of the car department.

The car department channel is a very useful frequency to monitor. As the car department works to ready the trains to roll on the high iron, the car men will radio the Yardmaster that the train is ready for departure.

◆ Diesel Shop and Store Department

In much the same way the car department has their repeater system, the diesel shop may also have a repeater system or two. This channel allows free access to the radio for the hostlers who move the locomotives from the diesel house to the awaiting trains.

In connection with the diesel shop is the stores department. The stores department may also have a channel or a repeater system for the movement of supplies to awaiting trains.

Both of these systems may only exist at larger yards, but can give valuable information concerning trains being readied for departure.

◆ Special Amtrak channels

Amtrak owns a small portion of its trackage and is a tenant on the other railroad's right-of-way for most trains. Amtrak does use 161.325 MHz for its line between Porter Junction and Kalamazoo, Michigan.

Amtrak also has commissary channels in Chicago and other large terminals, as well as various on-train frequencies for its crews to use while traveling the United States.

While traveling on a host railroad, the engine crew uses the radio channels of the hosting railroad. The trainmen on board have their low-powered handy-talkies for communication between each other while on board.

◆ Maintenance of Way

Another important use for railroad radio frequencies is the maintenance of way. Maintenance workers many times have their own radio channels for communicating between the crews and their supervisors. These crews may be track inspectors or signal maintainers. Sometimes these channels may be linked as a repeating system, too.

Most times the track inspectors use the road and dispatching channels to obtain work permits to use various segments of tracks for their inspections and to ensure their safety.



Norfolk Southern yard goat GP38-2 No. 5359 idles in East Wayne Yard in New Haven, Indiana, on a spring day

◆ Private Branch Exchange

Numerous railroads have a PBX or Private Branch Exchange channel, or a series of them for different regions. This typically functions as a repeater type system, but a few railroads use a duplex setup. Duplex systems use one channel for transmitting and another for receiving, but not at the same time. Monitoring a duplex system requires monitoring both channels, and not just a repeater output.

The PBX is the railroad's mobile telephone system. Today these systems are used less frequently than in the past, due to the low cost of cellular phones. Freight agents and maintenance crews still use this type of system. The Norfolk Southern calls their system the ARN, or Area Radio Network.

◆ Special Agent Man!

We cannot forget the special agents, or railroad police, I have mentioned in earlier articles. These men protect the railroad property and serve

as peace officers to the local community. The standard AAR (American Association of Railroads) railroad police channel is 161.205 MHz. Many times a repeater system is used for the special agents. This increases the area of coverage of the communications for the agents and helps protect their lives.

◆ The Many Uses of Rail Radio

We have touched on many uses for railroad radio from the road channels to the special agent channels. Railroads range in size from Class I railroads, such as the Union Pacific and Norfolk Southern, to regional railroads like the Dakota, Minnesota and Eastern, and on to shortlines like the Maumee & Western here in Indiana. Each railroad typically uses radios in its operations.

◆ Tourist Railroads

Even a tourist railroad such as the Manitowish & Pike's Peak Railway (161.550 MHz output/160.230 MHz input) uses radios in its general

tourist operations. The M&PP has a road repeater system as discussed above. The Cumbres and Toltec Scenic, which runs between New Mexico and Colorado, uses 161.505 MHz for its output channel and 160.305 MHz for the low-powered input frequency.

Private companies, which have their own railroads, may have railroad radio channels in use. Eastman Kodak in New York uses 160.305 MHz for their plant-switching railroad. Other industrial railroads may use business channels in both the VHF or UHF frequency range.

◆ Transit Railroads

Yet another use for railroad radio is by the nation's transit railroads, such as Metra in Chicago and even the Bay Area Rapid Transit in San Francisco. These railroads also have road, dispatcher, maintenance, yard, and police channels.

When you listen to the railroads, the men you typically hear on the trains are the hardy conductors and engineers. They can work legally on the trains for twelve hours continuously. Then they "Go dead on the law!" You will hear crews dying all the time on the railroad radio channels. This just means their twelve-hour work limit has expired. Federal law mandates the 12-hour time limit. Just remember! Railroadng is a hard life for these workers.

While I am typing this column, I hear the Indiana Northeastern Railroad from Hillsdale, Michigan, switching while using their secondary radio channel 161.400 MHz. I have always heard them on 161.100 MHz, their general operations channel, but never on 161.400 MHz for switching until today. It pays to program in the licensed channels and monitor them for activity. It paid off for me today!

We welcome comments on this column and ask for verified lists of railroad radio frequencies to publish here. Active frequencies for both current railroads and newly discovered channels for new operations are most welcome. Send us the railroad frequencies you listen to with the actual use for each of these frequencies. We strive to make this railscanning column a success, which means sharing reliable information and answering your questions about this popular aspect of the radio hobby.



Norfolk Southern RoadRailer No. 255 races by Notestine Road near Grabill, Indiana.

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International Notes

This column may be called *American Bandscan*, but on occasion lucky DXers do hear stations from other countries. This month, we have a few news items on stations outside the US.

◆ Mexico

We'll start near the border, in northwestern Mexico. Listeners in Southern California and Arizona have been noticing severe interference from two Mexican stations. XEKT-560 and XESS-780 both transmit from Puerto Nuevo, Baja California Norte, near Ensenada. The two stations both operate at 20 kilowatts daytime, 10 kilowatts night, non-directional. As one might guess, the non-directional nighttime operation results in severe interference to stations like KUZZ-550 (Bakersfield), KLAC-570 (Los Angeles), KBLU-560 (Yuma), and KABC-790. (Los Angeles)

U.S. law requires that anyone wishing to use studios in this country to provide programming to a transmitter in another country for beaming back into the U.S. must obtain a "325(c)" permit from the FCC. For example, the Fox TV affiliate covering San Diego is licensed by the Mexican government and uses a transmitter in Tijuana. Fox has obtained a 325(c) permit allowing it to provide programming to this station. XEKT and XESS have been the subject of two such permits.

A 325(c) permit requires certification that the foreign transmitter complies with all international agreements. The U.S. complainants allege that XEKT and XESS are not coordinated with the U.S., as provided by bilateral agreements, and are in violation of the 325(c) permits. It's also alleged that a U.S. citizen, Jaime Bonilla Valdez, financed the frequency and power changes that resulted in the interference, and that his spouse is 98% owner of the Mexican company that manages the stations.

(While these stations are not coordinated internationally, they do appear to hold valid licenses for these frequencies and power levels from the Secretaría de Comunicaciones y Transportes (SCT), Mexico's equivalent of the FCC.)

Mr. Bonilla, it turns out, also controls three U.S. stations. The licensees of three of the American stations suffering from interference have now filed a petition demanding the revocation of Bonilla's U.S. licenses. The stations that would be revoked would be

KJDJ-1030 San Luis Obispo; KURS-1040 San Diego; and KCHC-106.3 Willows, California. You can read the petition (and a number of interesting attachments!) on http://earthsignals.com/add_CGC/Bonilla_Revoke_Petition.pdf

◆ Mixing It Up

Italy has become far more difficult to DX on the AM band. According to <http://dxing.info>, on May 15th, *Radiotelevisione Italiana* (RAI) closed two of their three national AM networks. Often-DXed frequencies like 846 and 1332 kHz have been shut down, as has the only longwave station in the country (189 kHz in Caltanissetta). The 702 kHz transmitter in France, which had carried RAI programs, will no longer do so.

This source also reports a new expanded-band station, *Radio Guarayu*, on 1610 in Argentina. Since the one high-powered 1610 kHz station in the U.S. shut down, the Argentine station might be DXable in the U.S. this winter.

Last month I reported that Radio Sawa, broadcasting from Djibouti to the Middle East, had been reported on the East Coast. I neglected to mention the frequency – 1431 kHz – and made the rash assumption everyone knows where Djibouti is! It's in northeastern Africa, between Ethiopia and Somalia.

Another new American-sponsored station serving the Middle East is *Radio Aap ki Duniya*, broadcasting to Pakistan and India in Urdu on 972 kHz from a transmitter in Tajikistan. This one will be a very difficult catch from the U.S.! It might, however, be quite DXable by anyone serving in the military in Iraq or Afghanistan.

Coming back to the Americas and easily DXed countries... A number of DXers are reporting hearing *Radio Marti*, the anti-Castro station, on 1620 kHz. No official lists include this frequency. There has been some speculation unwanted spurious emissions or

spurious responses of receivers are involved; however, it would be unlikely for many different models of receiver to generate the same spurious reception, and the Voice of America (which provides Marti's transmitters) is not known for allowing technical faults to continue for long periods.

Some DXers have observed that when Marti is being heard on 1620, *WDHP* in the U.S. Virgin Islands is *not* being heard. Many now believe that the Radio Marti station on 1620 is *WDHP*, presumably being paid by the VOA to carry the Marti programs.

◆ Bits and Pieces

WFAN Opportunity: Coming back to the U.S. now... Patrick Griffith reports that a storm on April 18th destroyed several towers at KFAN-1130 Minneapolis. The station has been operating with only one tower – non-directionally – since then. Power is 12.5 kW daytime, 6 kW night. It's been heard all the way to both coasts, and is quite strong here in Tennessee. Format is all sports but with plenty of local advertisements and IDs. KFAN is normally very directional straight north – and is very difficult to log at night unless you happen to live in northern Minnesota!

Software Defined Radios: For the real techheads, the same GNU Project that arguably brought us the Linux operating system is tackling software-defined radios. There are some tantalizing projects mentioned on <http://www.comsec.com/wiki>. Check out <http://www.comsec.com/wiki?HowtoHdTv> (which is a software digital TV receiver); <http://www.comsec.com/wiki?GnuRadioFaq> (which lists several interesting projects, including a digital TV transmitter), and <http://www.erikyyy.de/tempest/> (which is not actually a GNURadio project, but uses your computer monitor as an AM transmitter!)

July is the "off-season" for long-haul foreign DX, but closer-in countries like Cuba and Mexico are definitely still possible. Are you hearing anything from outside the U.S.? Write me at 7540 Highway 64 West, Brasstown NC 28902-0098, or by email to dougsmith@monitoringtimes.com. Good DX!



The Secretaría de Comunicaciones y Transportes is the Mexican government agency responsible for licensing broadcasting stations.

USA to Use Aircraft for Anti-Castro Clandestines

According to the French-based AFP, which claims to be the world's largest news wire service, and confirmed in early May by the Reuters news service, US President Bush has announced plans for clandestine broadcasts to Cuba using transmitters on C-130 military aircraft. The United States has routinely utilized airborne transmitters in areas of military conflict in the past. But, this new clandestine broadcasting strategy would mark the first use of aircraft for routine clandestine broadcasting by the United States toward a country that is not experiencing a war situation on the ground.

The White House in Washington announced that the President plans to spend up to \$59 million during the next two years to defray the cost of this airborne broadcasting. Programming will apparently be dominated by Radio Marti and TV Marti shows. The United States has operated both Radio and TV Marti for several years, but its transmissions have been generally been subject to effective jamming by Cuba.

President Bush himself announced in early May that he plans to "modernize" the broadcasting efforts to Cuba by the United States. Bush said in an official press statement that he plans to spend "up to \$18 million for regular airborne broadcasts to Cuba and the purchase of a dedicated airborne platform for the transmission of Radio and Television Marti into Cuba." The remainder of the \$59 million will be devoted to other "democracy building" efforts in Cuba.

No frequencies have thus far been announced for this expanded quasi-clandestine broadcasting effort by the United States, but the transmissions are certain to be interesting DX targets in all of North America, not just in Cuba. We thank David Crawford for the initial tip on this major breaking story, which originally appeared in *DXplorer*.

◆ Havrilko's ACE Column

The Association of Clandestine radio Enthusiasts, still the largest radio club in North America devoted to monitoring of unlicensed broadcasting, has announced the expansion of its clandestine station coverage. Vince Havrilko, a veteran DXer, has assumed editorial duties for the monthly "Clandestine Profile" column in *The ACE*. If you would like a sample copy, why not send \$1 to the Belfast pirate maildrop listed below? The bulletin contains detailed loggings of both pirate and political clandestine broadcasts.

◆ What We Are Hearing

Monitoring Times readers heard all of these North American pirate broadcasters this month. Pirate radio stations operate on a sporadic schedule, but shortwave pirate broadcasting increases noticeably on weekends and during major holiday periods. You sometimes have to tune your dial up and down through the pirate radio band to find the stations, but the new primary North American pirate frequency of 6925 kHz, plus or minus 30 or 40 kHz remains the best place to scan for the pirates. More than 90 percent of all North American shortwave pirate broadcasts are heard on 6925 kHz. The old 6955 and 6950 kHz frequencies have increasingly been abandoned by pirates because of interference from licensed stations, but there are occasional broadcasts on nearby frequencies.

Indira Calling- This is one of the All India Radio parodies on the pirate bands. Some of their East Indian music includes songs by the Beach Boys! Their "Calcutta" address is actually in Rhode Island. (Providence)

Ironman Radio- Scuffy Swab recently held a pirate radio contest where you had to vote for pirate stations that were represented by the songs. (Belfast)

Radio First Termer- We are still hearing old replays of the old commemorative program about military entertainment stations from the Vietnam war era, allegedly operated by legendary DJ Dave Rabbit, a different character from Commander Bunny at **WBNY**. We thank Hilary for a tip on this, although he did not reveal his name, just like the anonymous DJ on this show. (None)

Radio Free Ancaster- This new one is allegedly named for a city in Ontario. Their programming has been live acoustic guitar songs. (Merlin)

Ragnar Radio- Transmitting "from the Great Lakes," this one features rock music. (Uses rangarradio@yahoo.com e-mail)

Smooth Blues Radio- They have been on multiple times now with blues music. (Uses smoothbluesradio@yahoo.com e-mail)

Sycko Radio- The spelling of "Psycho" Radio is still uncertain, but they are back on the air with well produced rock music. (None)

Take it Easy Radio- Rock music is their main fare, but political discussions and pirate advocacy are getting more common during their shows. (Uses takeiteasyradio@yahoo.com e-mail)

Undercover Radio- Dr. Benway's continues to mix messages from Mars in with his rock music. (Merlin and undercoverradio@mail.com e-mail)

United Patriot Militia Bingo- Steve Anderson's **KSMR** clandestine is long gone, but the pirate parody of Steve's station lingers on. (None)

WBMR- Mike O. Farad's Black Mountain Radio normally has a mix of techno rock and electronically generated voices, plus reruns from Beavis and Butt-head. (Uses wbmradio@hotmail.com e-mail)

WHYP- The James Brown memorial station still commemorates a licensed station in North East, PA. Brown's home town touch is supplemented by rock, humor, and pirate comedy (Providence)

WMFQ- The inevitably obscene slogan at this one is amusing, given the fact that it promotes the QSL process. (Providence)

WMPR- "Micro power radio's" techno rock "dance party" format is still a regular occupant on the pirate bands. This month we picture their cover letter for a very rare package of their QSLs, which were sent for distribution to attendees of the Winter SWL Festival in Kulpville, PA. (Still none)

Dear George,

I thought it might be fun for the group, and it would help me with my backlog of QSLs if you could call people up and give these out during your presentation. Toss out the QSLs you don't give away, or maybe you can get them to send you a s.a.s.c. somehow ...or give them to J.T.A. to mail?

Thanks From the Folks at WMPR

◆ QSLing Pirates

Reception reports to pirate stations require three first class stamps for USA maildrops or \$2 US to foreign locations. The cash defrays postage for mail forwarding and a souvenir QSL to your mailbox. Letters go to these addresses, identified above in parentheses: PO Box 1, Belfast, NY 14895; PO Box 28413, Providence, RI 02908; and PO Box 293, Merlin, Ontario N0P 1W0. Some pirates prefer e-mail, bulletin logs or internet web site reports instead of snail mail correspondence.

The best bulletins for submitting pirate loggings with a hope that pirates might QSL the logs remain *The ACE* (\$2 US for sample copies via the Belfast address above) and the e-mailed Free Radio Weekly newsletter, still free to contributors via niel@ican.net. The Free Radio Network web site, another outstanding source of content about pirate radio, is found at <http://www.frn.net> on the internet, and some pirates will QSL a report left on the FRN.

◆ Thanks

Your loggings and news about unlicensed broadcasting stations are always welcome via 7540 Highway 64 W, Brasstown, NC 28902, or via the e-mail address atop the column. We thank this month's valuable contributors: John T. Arthur, Belfast, NY; Kirk Baxter, North Canton, OH; Artie Bigley, Columbus, OH; Ross Comeau, Andover, MA; David E. Crawford Titusville, Florida; Jerry Coatsworth, Merlin, Ontario; Rich D'Angelo, Wyomissing PA; Mike Fanderys, Parma, OH; Harold Frodge, Midland, MI; Harry Helms, Las Vegas, NV; Vince Havrilko, Kadena AB, Okinawa; Ed Kusalik, Coal Dale,

Panamsat Galaxy 11

Ku-Band - 91 degrees West longitude

| | | |
|-------|-------|---|
| 1(H) | 11720 | Data Transmissions |
| 2(V) | 11740 | Data Transmissions |
| 3(H) | 11760 | Data Transmissions |
| 4(V) | 11780 | Data Transmissions |
| 5(H) | 11800 | Data Transmissions |
| 6(V) | 11820 | Occasional video |
| 7(H) | 11840 | Data Transmissions |
| 8(V) | 11860 | Data Transmissions |
| 9(H) | 11880 | Data Transmissions |
| 10(V) | 11900 | Data Transmissions |
| 11(H) | 11920 | Data Transmissions |
| 12(V) | 11940 | Occasional video |
| 13(H) | 11960 | Occasional video |
| 14(V) | 11980 | Occasional video |
| 15(H) | 12000 | Occasional video |
| 16(V) | 12020 | Occasional video |
| 17(H) | 12040 | Data Transmissions |
| 18(V) | 12060 | Primedia Workplace Learning (digital); Primedia feeds; Law Enforcement TV; Fire and Emergency TV Network; Health and Science TV Long Term Care Network; Texas Cable News; Yesterday USA Radio |

| | | |
|-------|-------|---|
| 19(H) | 12080 | Data Transmissions / Occasional video (digital) |
| 20(V) | 12100 | Data Transmissions |
| 21(H) | 12120 | Data Transmissions |
| 22(V) | 12140 | Data Transmissions |
| 23(H) | 12160 | Data Transmissions |
| 24(V) | 12180 | Data Transmissions |

South American-beamed Transponders

| | |
|----------|-------|
| 1-EX(V) | 10964 |
| 2-EX(H) | 10976 |
| 3-EX(V) | 10994 |
| 4-EX(H) | 11006 |
| 5-EX(V) | 11024 |
| 6-EX(H) | 11036 |
| 7-EX(V) | 11054 |
| 8-EX(H) | 11066 |
| 9-EX(V) | 11084 |
| 10-EX(H) | 11096 |
| 11-EX(V) | 11114 |
| 12-EX(H) | 11156 |
| 13-EX(V) | 11144 |
| 14-EX(H) | 11156 |
| 15-EX(V) | 11174 |
| 16-EX(H) | 11186 |

Intelsat Americas 6

C-Band - 93 degrees West longitude

| | | |
|-------|------|--|
| 1(V) | 3720 | TEN*Max adult service (VC2+) |
| 2(H) | 3740 | Data Transmissions / TCT Ministries (digital) |
| 3(V) | 3760 | ABC Network - East (LEITCH) |
| 4(H) | 3780 | Occasional video |
| 5(V) | 3800 | Occasional video |
| 6(H) | 3820 | Occasional video |
| 7(V) | 3840 | TEN*Xtasy adult service (VC2+) |
| 8(H) | 3860 | Public Broadcasting Service Schedule X; 5.65 Descriptive video / SAP Audio |
| 9(V) | 3880 | Occasional video |
| 10(H) | 3900 | Occasional video |
| 11(V) | 3920 | The Spaceconnection (occasional video services) |
| 12(H) | 3940 | ABC Network - West (LEITCH) |
| 13(V) | 3960 | Occasional video |
| 14(H) | 3980 | Occasional video |
| 15(V) | 4000 | Occasional video / North Carolina Open Net (occ) |
| 16(H) | 4020 | Occasional video |
| 17(V) | 4040 | Occasional video |
| 18(H) | 4060 | Occasional video |
| 19(V) | 4080 | Occasional video / CBS HDTV (occ digital) |
| 20(H) | 4100 | CBS Network / UPN Network (digital) |
| 21(V) | 4120 | Occasional video |
| 22(H) | 4140 | Occasional video |
| 23(V) | 4160 | Paramount / King World (digital) |
| 24(H) | 4180 | Occasional video |

Intelsat Americas 6

Ku-Band - 93 degrees West longitude

| | | |
|-------|---------|---|
| 1(V) | 11728.5 | CBS Newsnet (digital) / CBS newsfeeds (digital) |
| 2(H) | 11735.0 | Data Transmissions / Reuters World Television Service (digital) |
| 3(V) | 11789.5 | CBS newsfeeds (digital) |
| 4(H) | 11796.0 | Hearst-Argyle / Sinclair newsfeeds (digital) |
| 5(V) | 11836.0 | Data Transmissions |
| 6(H) | 11842.5 | Old Dominion University EdNet (digital) |
| 7(V) | 11867.0 | Data Transmissions / University Network - Dr. Gene Scott (digital) |
| 8(H) | 11873.5 | Russian Media Group (digital) Russian TV Network / WMNB RTR Planeta Russian World (digital) |
| 9(V) | 11898.0 | Data Transmissions |
| 10(H) | 11904.5 | Occasional video (digital) |
| 11(V) | 11929.0 | ABC newsfeeds (digital) |
| 12(H) | 11935.5 | Data Transmissions |
| 13(V) | 11960.0 | ABC newsfeeds (digital) |
| 14(H) | 11966.5 | ABC newsfeeds (digital) |
| 15(V) | 11991.0 | Data Transmissions |
| 16(H) | 11997.5 | Data Transmissions |
| 17(V) | 12022.0 | Data Transmissions |
| 18(H) | 12028.5 | Data Transmissions |
| 19(V) | 12053.0 | ABC newsfeeds (digital) |
| 20(H) | 12059.5 | FOX newsfeeds (digital) |
| 21(V) | 12084.0 | Data Transmissions |
| 22(H) | 12090.5 | Occasional video (digital) |
| 23(V) | 12115.0 | Data Transmissions |
| 24(H) | 12121.5 | FOX newsfeeds (digital) |
| 25(V) | 12146.0 | DMX for Business (digital) |
| 26(H) | 12152.5 | Data Transmissions |
| 27(V) | 12177.0 | Data Transmissions |
| 28(H) | 12183.5 | Data Transmissions |

Panamsat Galaxy 3C

C-Band - 95 degrees West longitude

| | | |
|-------|------|--|
| 1(H) | 3720 | International Broadcasting Bureau (digital): VOA Television; Al Hurra; American Embassy Television Network; VOA Music Mix radio; VOA News Now radio; Radio Free Europe / Radio Liberty; VOA audio services (digital) |
| 2(V) | 3740 | Occasional video |
| 3(H) | 3760 | Occasional video |
| 4(V) | 3780 | Occasional video |
| 5(H) | 3800 | Data Transmissions |
| 6(V) | 3820 | Occasional video |
| 7(H) | 3840 | Occasional video |
| 8(V) | 3860 | Occasional video |
| 9(H) | 3880 | Occasional video |
| 10(V) | 3900 | Horse Racing (digital) / Gem Shopping Network (digital) / PhoneBet TV (digital) |
| 11(H) | 3920 | Horse Racing (digital) |
| 12(V) | 3940 | Horse Racing (digital) |
| 13(H) | 3960 | Horse Racing (digital) |
| 14(V) | 3980 | Horse Racing (digital) |
| 15(H) | 4000 | Occasional video |
| 16(V) | 4020 | Occasional video |
| 17(H) | 4040 | Occasional video |
| 18(V) | 4060 | FOX Network (digital) / 20th Century Fox syndication (digital) |
| 19(H) | 4080 | FOX Network (digital) |
| 20(V) | 4100 | U.S. Digital Television (USDTV) (digital) |
| 21(H) | 4120 | Occasional video |
| 22(V) | 4140 | Occasional video |
| 23(H) | 4160 | Occasional video |
| 24(V) | 4180 | Occasional video |

Panamsat Galaxy 3C

Ku-Band - 95 degrees West longitude

| | | |
|--------|-------|------------------|
| T01(H) | 11720 | Occasional video |
|--------|-------|------------------|

| | | |
|--------|-------|---|
| T02(V) | 11750 | Data Transmissions / Occasional video |
| T03(H) | 11750 | FM Squared Audio Services Data transmissions .06, 2.93, 2.97, 3.01, 3.03, 3.08 and 3.12 MHz In-Store audio network ads (various companies) .71, .81, .88, 1.07, 1.15, 1.24, 2.07, 3.25, 3.44, 3.62, 3.69, 3.78, 3.88, 3.97 4.20, 4.55 and 4.64 MHz Muzak Services .15, .27, .39, .51, .98, 1.35, 1.47, 1.59, 1.72, 1.83, 1.95, 2.19, 2.31, 2.43, 2.56, 2.68, 2.79, 3.34, 3.53, 4.08, 4.32, and 4.45 MHz |
| T04(H) | 11780 | CCTV-4, CCTV-9 (digital) |
| T05(V) | 11810 | Data Transmissions / Occasional video |
| T06(H) | 11810 | Racetrack Television Network (digital) |
| T07(H) | 11840 | Occasional video |
| T08(V) | 11870 | Data Transmissions |
| T09(H) | 11870 | Data Transmissions |
| T10(H) | 11900 | Data Transmissions |
| T11(V) | 11930 | Data Transmissions / Occasional video |
| T12(H) | 11930 | Occasional video / Channel 1 (occ) |
| T13(H) | 11960 | Data Transmissions |
| T14(V) | 11990 | Data Transmissions |
| T15(H) | 11990 | Occasional video |
| T16(H) | 12020 | FM Squared Audio Services Quiet Audio Carriers: .99, 1.11, 1.95, and 3.12; Data transmissions: .08, .65, 2.18, 2.52, 2.82, 2.91, 3.04, 3.22, 3.40, 3.97, 4.10 and 4.14 MHz In-Store audio networks .15, .27, .39, 1.59, 1.71, and 1.83 MHz |
| T17(V) | 12050 | Data Transmissions |
| T18(H) | 12050 | The Spaceconnection (occasional video services) |
| T19(H) | 12080 | Data Transmissions |
| T20(V) | 12110 | Data Transmissions |
| T21(H) | 12110 | Data Transmissions |
| T22(H) | 12140 | Occasional video |
| T23(V) | 12170 | Data Transmissions |
| T24(H) | 12170 | Data Transmissions |

Intelsat Americas 5

C-Band - 97 degrees West longitude

| | | |
|-------|------|---|
| 1(V) | 3720 | ABC Network - East (LEITCH) / ABC Network feeds (occ) |
| 2(H) | 3740 | Nebraska Educational Television (digital) / Data Transmissions |
| 3(V) | 3760 | Urban America Television Network (digital) / TCT Ministries (digital) |
| 4(H) | 3780 | Nebraska Educational Television (digital) |
| 5(V) | 3800 | The Spaceconnection (occasional video services) |
| 6(H) | 3820 | CBS Network backup / UPN Network backup (digital) |
| 7(V) | 3840 | Occasional video |
| 8(H) | 3860 | Data Transmissions |
| 9(V) | 3880 | The Spaceconnection (occasional video services) |
| 10(H) | 3900 | Occasional video |
| 11(V) | 3920 | Bonneville Satellite (digital) / BYU-TV, Latter Day Saints radio, KSL-AM, Salt Lake, Utah (digital) |
| 12(H) | 3940 | ABC Network - East (LEITCH) / ABC HDTV (occ digital) |
| 13(V) | 3960 | Occasional video |
| 14(H) | 3980 | The Spaceconnection (occasional video services) |
| 15(V) | 4000 | Occasional video |
| 16(H) | 4020 | Occasional video |
| 17(V) | 4040 | Bonneville Satellite (digital) / SCOLA Channels 1, 2, 3 and 4 (digital) |
| 18(H) | 4060 | American Forces Network (AFN) (digital) |
| 19(V) | 4080 | The Spaceconnection (occasional video services) |
| 20(H) | 4100 | Occasional video |
| 21(V) | 4120 | ABC Network - West (LEITCH) |
| 22(H) | 4140 | ABC Network - East (LEITCH) |
| 23(V) | 4160 | Occasional video |
| 24(H) | 4180 | Occasional video |

Giving Something Back

If you're like most of us, you derive a great deal of pleasure from your radio hobby. You spend a significant part of your spare time tuning the bands in search of new and interesting signals. Our sport has even been called the "King of hobbies," because there are so many branches to explore – all under the main banner of "Radio."

While I have many interests, my personal focus is longwave, because of the challenges it offers and the variety of signals that can be heard there.

Have you considered sharing your own interest and knowledge about longwave with a local radio club? Most clubs hold monthly meetings, and the centerpiece of these events is usually a program of some kind. Clubs are in constant need of programs, and your enthusiasm for a unique part of the spectrum could be just what they are looking for. Hams, in particular, are likely to have a strong interest in the 160-190 kHz "Lower" band, or the international work that is going on at 137 kHz.

You say you're not the technical type? Don't worry. You can present your program from a listener's perspective. No one is expected to be an expert in all things, and your enthusiasm for the band is what will count. On the other hand, if you *do* have some area of technical expertise (QRSS, antennas, circuit design, etc.) feel free to make that the focus of your presentation. You can choose the direction your talk will take!

Not comfortable with public speaking? Relax, you're in good company. Many people struggle with this challenge, including me. Nevertheless, after presenting at a few radio meets, I found that it is not that difficult, and reaching a new milestone was a very rewarding experience. Remember that you'll be dealing with fellow radio enthusiasts, so can expect a friendly and supportive audience, not a hostile one!

◆ Getting Started

The first step in presenting a program is to make contact with your local radio club. Check the club's website or get a recent copy of their newsletter for contact information. If you're not sure what clubs are active in your area, visit the ARRL website at <http://www.arrl.net> and click the "Clubs" button at the top of the homepage.

When you make contact, explain your proposed program and why it would be of interest to club members. Assuming they accept your offer, ask how long your talk should be to fill the allotted time, and discuss any special facilities

you'll need to present your material.

◆ Building an Outline

Once you get the go-ahead, it's time to get busy on your end. I like to start with an outline. I'm not talking about one of those stuffy formats we all learned in English class – just something that represents a logical flow of material and identifies the main points you want to cover.

Here's a tip: Try putting yourself in the place of an audience member who may be radio-aware, but have only limited knowledge of activities below 500 kHz. In this way, you can anticipate the questions that will come up and tailor your outline accordingly. Remember too, that your audience will have widely varied experience levels, so try to arrange your topics in a way that holds something for everyone.

Reprinted here, is an outline I wrote for a recent talk on longwave. Obviously, each program will require a unique approach, but if you decide to take the plunge, feel free to use this outline as a starting point and adapt it accordingly.

1. OPENING REMARKS

- Welcome the participants, thank them for attending
- Explain my background and monitoring interests
- Give an overview of what will be covered
- Encourage questions at any time
- Ask some "feeler" questions of the group

2. INTRODUCTION TO LONGWAVE

- Why the curiosity in LW monitoring?
- Its position in the radio spectrum
- What can be heard (beacons, LWBC, military, natural radio, etc.)
- Lower band Intrigue (160-190 kHz)
- Play sound samples of LW signals
- Show photos of typical stations/equipment

3. TUNING IN TO LONGWAVE

- Receiving gear (commercial, surplus, homebrew)
- Antenna options (pros/cons of each)
- Accessories (preamps, filters, headphones)
- Computer-assisted modes (QRSS, BPSK, etc.)
- Tuning techniques for weak signals
- Logs and record-keeping
- Confirming your catch (QSLing)

4. FURTHER RESOURCES

- Publications/catalogs
- Parts suppliers
- Clubs for LF and utility monitors
- Web resources

5. WRAP-UP

- Review of topics
- Distribute handouts
- Questions & Answers
- Challenge to tune-in!

Visuals and Sound

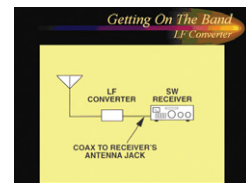
With the outline complete, you are ready to pull together the visuals that will support

your program. I like to present a slide show that includes a mix of bulleted text, tables and graphics. This can be either a traditional show with transparencies, or it can be PC-based, using a laptop computer and an LCD projector.

The latter approach has gained huge popularity in recent years, and has never been easier to use. All you need is some presentation software such as Microsoft PowerPoint to help you look like a pro. (Many PCs come with such software installed, or it can be purchased separately.)

Need an example of a slide show? I would be happy to provide a printed copy of my Kulpville '04 program in exchange for an SASE.

Radio listeners love sound! For this reason, I always try to incorporate some sound samples into my programs. Use a fresh 60-minute cassette tape, and record some of your favorite LF intercepts on it. Use your receiver's Line Level/Record output to make the tape, if possible. This ensures a more constant volume level on playback. You can order the recordings to match your talk, so that you only need to press the "Play" button at the right time. Sounds can even be stored digitally on your PC, although I have not ventured into that territory yet!



A sample image from a longwave slide show

◆ Final Tips

1. Do a practice run of your program with a small audience. It will help you set the pacing and work out any rough spots.
2. Be sure to have some type of handouts for the attendees. These can be frequency lists, web addresses or other resources for learning more. Even a printout of your slide program will be useful.
3. Arrive at the meeting site early! Leave yourself plenty of time to set up displays and become familiar with the surroundings.
4. Have an assistant to help you with handouts, running cords, showing equipment samples, and so on. Having an assistant can be a morale builder, too.
5. Have fun! Be sure to jot a note to *Below 500 kHz* and let me know how things went.

As usual, I've run out of space for another issue. Before signing off, I do want to congratulate Ed Walsh (AL) and Gerry Gomes (MI) for winning our **WWVB Trivia Contest** in the June issue. Both will receive their choice of a *BeaconFinder* directory, or a *Sounds of Longwave* tape, as advertised in *MT*. Check the "Letters" section on page 6 for their trivia answers.

Are You Ready?

Whenever I set out to write an *Amateur Radio* article related to emergency preparedness, I come to realize that much of what I have to say can apply, not just to radio folks, but anybody who wants to either help out in an emergency or, at the very least, keep their families and themselves safe from harm.

Ever since the fateful day when the World Trade Center buildings were collapsed by terrorists, every agency involved with emergency services, even in the most peripheral way, has been forced to reconsider its emergency response plan. National, state and local emergency management systems have been changed and even new organizations have been developed to meet the perceived needs for all types of emergencies.

Recently, I've become involved with the Community Emergency Response Team training program in New Jersey. While all of the other emergency response systems I am involved with were in existence before 9/11, the CERT program is a relatively new initiative developed under the umbrella of the U.S. Fire Administration, FEMA and the U.S. Department of Homeland Security. CERT training is an excellent adjunct to amateur radio emergency preparedness and I would recommend it to any individual or organized radio group. You can find more information about this excellent program at <http://training.fema.gov/EMIWeb/CERT/>. And the next time you are at an emergency training or actual response event, keep an eye out for the folks in the green hard hats and vests.

Okay, so what am I getting at here? Well, what I was most impressed with in the CERT program was its emphasis on *readiness*. Underlying much of the training is the very basic notion that developing a reasonable state of preparedness is the key to being *flexible* enough to provide a useful response in any emergency. Also, the program stresses the notion that a proper degree of readiness allows you to remain an asset and not become a liability, or worse yet, a victim yourself.

It's surprising how sometimes very simple matters can take you out of the game. In my own experience, in the aftermath of many ARES/RACES support activities, I've had to give someone a jump start because their car battery died after using it to power their radios for far too long. Even more common are folks who never checked the quality of the batteries in their handheld gear, losing useful power long before the event ended.

But what about more complicated problems? I've had folks need to secure from their operational position because they forgot their critical medications and needed to go home for their own safety. I've also run across people who have had to drop out of an activity because they underdressed for the weather.

All these situations could have been prevented by a bit of prior thought. These were all volunteer support activities (walk-a-thons, parades, etc.). In a true emergency, the situation is often "grab and go." No time for last minute preparation.

In real emergencies, lack of preparation is only going to make things more complicated. Now you have a situation where the loss of any assets can effect people's lives and well being. Further, the process of bringing that person out of the tactical environment and shifting assets costs dearly in terms of time, if nothing else.

So how can you best prepare for a neighborhood or regional emergency, both as a radio amateur and as a good citizen?

Now here I'm going to skunk you folks a bit. I got this first tip from a New Jersey State Police Sergeant as part of the CERT curriculum.

◆ Is your FAMILY ready for an emergency?

Think about it for a moment. Are you going to be able to be your most useful when you run off to help with your ARES/RACES or other volunteer effort if all you are able to focus on is the situation of your kith and kin? You need to make sure that your family has been prepared for and has adequate resources to meet the needs of any emergency before you start packing your ham radio "go bag."

When I went off to run our County Emergency Services Radio Net during Hurricane Floyd a few years back, it was secure in the knowledge that my house had been battened down, the family vehicles were all gassed up, as was the generator. Extra ice was in the freezer to be transferred to coolers as needed. Lots of canned food and fresh water was stored, enough for five days (food for the pets as well). Both tanks for my LP gas grill were filled.

I also left my most capable spouse with the list of further directions such as filling the bath tubs with water in the event of a power outage. The entire family reviewed the location of house and street shut offs for all utilities. They knew to monitor the scanners and local radio (all battery backed up, of course) to be

prepared for evacuation if conditions required it. Get the picture? Because my family was ready to face the emergency I could concentrate on assisting others during the emergency.

If you want to take a closer look at ideas for personal and family preparedness, I would suggest reviewing the check lists that can be found at the U.S. Department of Homeland Security's Web site for such matters: <http://www.ready.gov/> and at the American Red Cross Web Site: <http://www.redcross.org/services/disaster/>. Both these sites offer tons of practical information that should help you and your family become as prepared as possible, and in so doing, free you up to help out with your special radio skills.

In perusing the above websites and other similar resources, you can begin to formulate preparedness ideas that can relate directly to making you and your radio gear ready for any major event that might come your way. To these and other notions, I'd like to add a bit of my own experiences.

◆ Bucket Brigade

Lately, in relation to both radio and non-radio preparedness activities, I have become a big fan of the common 5 gallon, lidded pail. Five gallon pails can be found in any home improvement or hardware store. They can be closed relatively securely and you can cram a whole lot of stuff into one or more pails. These can really be turned into true "grab and go" emergency kits. You might want to consider creating two pails to carry in the trunk of your car or in some other way have them at the ready should any hard times come your way.

Pail One – Personal Effects And Necessities

In this container you will want to pack those items that will make your life on a tac-



tical scene as pleasant as possible. The usual post for a ham in an ARES/RACES activation is to be placed at a check point at some distance from the Operational Headquarters. During that time, it is likely to be, minimally, several hours up to 24 hours before you might be relieved. So what to pack to help make the best use of the time and duty? These are just some loose guidelines for you to build on. Your personal situation will dictate your planning.

- 2 liters of drinking water. Get small bottles so they can be better distributed in the pail with other items. (Note: Even Water has a "use by" date. Check frequently or write dates on outside of pail)
- 6 Energy Bars – Brand Names I have used and am familiar with include PowerBars, Cliff Bars, Luna Bars, Odwalla Bars. Just something to keep your stomach from growling.

- Rain Poncho
- Sweat Shirt
- Heavy Work Gloves
- Sunglasses
- Safety Glasses
- Baseball Hat (Choose your favorite team)
- Whistle (You'll be surprised how useful this will be)
- 3 dust Masks
- Moist Towelettes
- 1/2 Roll of Toilet Paper
- 1 Paperback Book you haven't read yet. (The thing you most often find yourself doing on scene is waiting.)
- Pens and a small notebook
- Small Flashlight and two sets of fresh batteries
- Small Personal First Aid Kit – Include your personal preference for pain and headache
- 2 Large Size Heavy Duty Plastic Garbage Bags
- Fill in any empty space with more water bottles.

As you can see, Pail One is going to contain all those little necessities of life that will allow you to stay on scene and relatively self-contained for a period of about 24 hours. Anyone who has ever manned a checkpoint at an all day walk-a-thon has probably wished for one or more of the items out of this pail at one time or another.

Once you seal up Pail One, put a note (or write on the lid) on top reminding you to grab at least three days supply of any personal medications and a spare pair of eyeglasses if you wear them.

On the outside of the pail write your name, call sign, phone number and any medical alerts that pertain to you.

Pail Two – Radio Stuff

Pail Two is going to be a bit more subjective. You need to think in terms of what you need to keep your gear running and useful. Here's some of what I pack.

- 5 Replacement Fuses for each radio (pack in cotton in old pill bottles)
- 2 PL259 Barrel Connectors (What does everyone run out of at Field Day?)
- 2 PL259 to BNC "Tweenies"
- 50 ft of RG8X terminated with PL259 connectors
- Custom cables for each of my radios to allow them to be hooked up to a car battery, Cigar Lighter Outlet, Molex or PowerPole connectors.
- 50 ft run of 14 gauge twisted pair wire. (Can

- even be split up and used with the above coax to make a handy dipole)
- 12 Volt Soldering Iron and Solder
- Small VOM meter – Nothing fancy, you just want to be able to check voltage and continuity in most cases.
- Small kit of basic tools – Include any special tools and wrenches your rigs require (usually torx or allen heads)
- A simple twin lead VHF/UHF "J-Pole" antenna that can be used with the above coax.
- 100 ft of Light Nylon Cord. (Remember – a half filled water bottle out of Pail One is a great weight for tossing lines up into trees.)
- Alkaline Batteries to replace rechargables in handhelds (2 sets for each radio)
- Lightweight earphones/headphones and adapters as needed (For high noise environments)
- Copies of essential information from all radio manuals
- Copies of your license and any other credentials you need to get the job done.
- Another small flashlight and extra batteries. (Because it is really hard to play radio in the dark.)
- 2 Rolls Electrical Tape
- 1 Roll Duct Tape
- Anything else related to keeping your radios up and running.
- Any remaining space in Pail Two can be devoted to additional runs of coax and batteries. You can never have enough of either when the going gets tough.

Now Murphy's Law guarantees I've left at least one or more essentials off my list. The best way to figure out any problems is to build up your pails and take them out for a field test at your next radio group event or

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10-10 Int. Summer SSB Contest
August 7 0000 UTC – August 8 2359 UTC

European HF Championship
August 7 1200 UTC - August 7 2359 UTC

North American QSO Party (CW)
August 7 1800 UTC - August 8 0600 UTC

ARRL UHF Contest
August 7 1800 UTC - August 8 1800 UTC

Maryland-DC QSO Party
August 14 1600 UTC – August 15 0400 UTC
August 15 1600 UTC – August 15 2400 UTC

North American QSO Party (SSB)
August 21 1800 UTC - August 22 0600 UTC

New Jersey QSO Party
August 21 2000 UTC – August 22 0700 UTC
August 22 1300 UTC – August 23 0200 UTC

Ohio QSO Party
August 28 1600 UTC – August 29 0400 UTC

activity. Readiness also involves *practice!*

Armed with your family emergency plans and a couple of well stocked pails, you will be ready to face anything that can reasonably be expected of you as a dedicated volunteer.

Let's hope we never need to use any of the above except on Field Day. Meanwhile, I'll see you on the bottom end of 40 meters.

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6. Two Meter Stainless Steel (small thick 4" pads) 20.3# \$599.00

The advantage of flush pads is they can accommodate larger base amounts without blocking ground plane mounting holes. Flush bases are more desirable when two extra pounds are not critical. 12- and 24-foot designs available direct from factory. Special Stainless or Rubber coated U-bolts available at additional charge.

Shipping and handling in the USA is a flat \$15.00 for the first unit and \$10.00 for each additional unit for four-foot units. Two meter units are \$20.00 for the first unit and \$15.00 for each additional unit via standard ground or USPS. Payment may be made by Visa, Mastercard, check or money order to Talon Creative Inc.

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Some Vertical Antennas

The vertical, quarter-wave, ground-plane antenna (fig. 1A) is a favorite for non-directional communications on the VHF-UHF bands. The vertical, quarter wave, grounded antenna, or Marconi antenna (fig. 1B) is a favorite for non-directional long-haul communication on the HF bands.

When we first encounter these two antenna designs we may wonder if the ground-plane antenna is not just a different version of the Marconi antenna. Both antennas have a quarter-wavelength long vertical element above a ground plane. For the ground-plane antenna the ground plane is a set of horizontal, or drooping radials, while for the Marconi the ground plane is what might be called "the ultimate ground plane": the earth itself. So we may wonder if these two antennas are really different in their function, or are they just variations on the same basic design?

Actually they are different in the manner in which they operate. Let's consider their differences. And remember, although we discuss the antennas in the transmitting mode, essentially all antenna characteristics such as patterns and gain are the same for reception as for transmission.

The Vertical, Quarter-Wave, Ground-Plane Antenna

This antenna consists of a quarter-wavelength vertical element above a set of 2 to 4 quarter-wavelength radials which make up the ground plane. The antenna is a resonant design: the vertical element, in conjunction with each of the individual radials, essentially constitutes a half-

wavelength dipole. In contrast to the non-radiating (reflecting) ground of the Marconi (see below) the ground-plane elements radiate signal. Each pair of radials produces horizontally polarized signals which have electric fields with opposing orientations. Thus the opposing fields essentially cancel each other when they are at a distance from the antenna, and the effective radiation which supports communication is from the vertical element.

If we droop the radials downward from the horizontal, their field orientations are somewhat less opposite than before, and less cancellation takes place. If we droop them down completely, so that they point to the earth, then their field orientations are identical – they no longer cancel each other at all. Then, together with the original vertical element, they make up a vertical dipole antenna.

The quarter-wave, ground-plane antenna finds application primarily at VHF-UHF frequencies, and, to a lesser degree, in the upper part of the HF band. When space and finances permit, it is even sometimes used in the HF or MF bands. At frequencies this low its elements may be loaded with inductance or capacitance to attain resonance with shorter elements.

The Marconi Vertical, Quarter Wave, Grounded Antenna

This antenna consists of a quarter-wavelength vertical element with its base near the earth beneath the antenna. In practice, to increase efficiency, the conductivity of the earth below the antenna is typically supplemented by bur-

ied wires running out radially from the base of the antenna.

This is a resonant design; however, the buried radials do not combine with the vertical element to form a resonant circuit. The radials needn't be a quarter wavelength, but instead should be made as long and as numerous as is practical. The combination of earth-and-wire beneath the antenna reflects much of the signal coming from the radiating vertical element. Thus the antenna is said to have an image in the earth.

This image is analogous to the visual image formed if the antenna were placed upright on a large mirror. The combination of signal radiated from the vertical element, and the portion of that signal reflected from the earth, interact to produce the antenna's vertical radiation pattern. As DX buffs know, this pattern contains a generous amount of low vertical-angle radiation.

The Marconi antenna finds application on the HF and MF bands. At frequencies much below the MF band the large size of the vertical element makes the antenna impractical. At frequencies above HF the vertical element would be a relatively small-to-tiny antenna when located directly at ground level; much too low a siting for good communications on the VHF-UHF bands. On the other hand, the antenna's small size is an asset for VHF-UHF mobile work. On these bands an automobile's metal top can provide the conductive, reflective "ground" needed for efficient operation by this design.

Above-Ground Radials for Marconi Antennas

Some installations have Marconi antennas with radials above ground rather than buried. Of course this means the entire antenna is elevated, with the radials still at the base of the antenna. Studies indicate that raising the antenna like this may lead to considerably-improved performance.

If the radials are above, but close to the ground, then the antenna would seem to be a legitimate Marconi by virtue of the close coupling to earth. But, if the radials are a quarter wavelength long, as they have been in the articles I've seen, then as the antenna is elevated sufficiently the Marconi morphs into a ground-plane antenna!

◆ Let's Make a Vertical Antenna

An article of mine on making your own ground-plane antenna can be found at the *Monitoring Times* web site given below.

Constructing a Marconi antenna with its many radials can be a major construction job, especially for the lower portions of the HF band. So

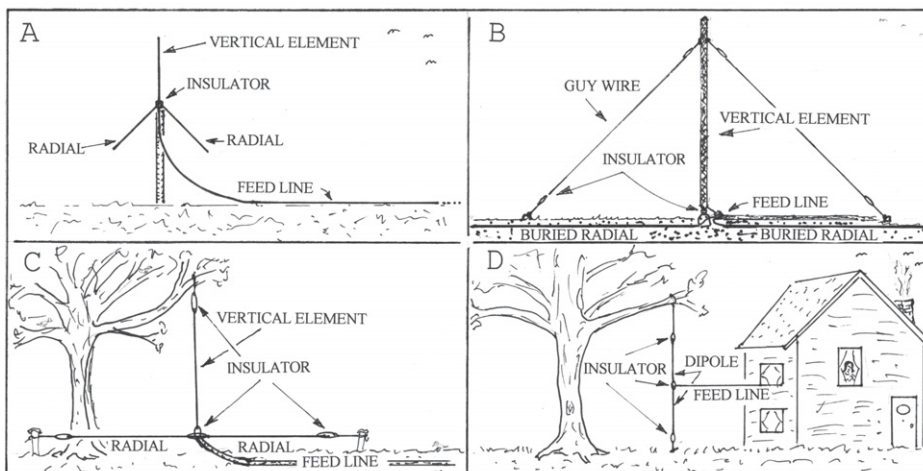


Fig 1. A vertical, quarter-wave, ground-plane antenna (A), A vertical, quarter wave, grounded, or Marconi antenna (B), A vertical quarter-wave antenna in a tree, (C), and a vertically-mounted, half-wavelength dipole (D).

This Month's Interesting Antenna-Related Web site:

Here is an interesting site with many antenna designs: <http://www.hamuniverse.com/antennas.html>
And here's my take on building a simple, full-performance, ground-plane antenna: <http://www.monitoringtimes.com/html/mtantennaprimer3.html>

let's check out some easy-up non-directional vertical antennas that can support good monitoring.

The easiest-up vertical antenna I know of is a living tree. A quickie feed method is attaching the shield of the coax feed line to a nail driven into the tree at ground level, and the center conductor of the coax to a nail driven a foot or two above the ground. Try nails at various heights to see which gives best signals. Various operators, including myself, have had excellent reception using a tree.

Another easy-up vertical can be had by stringing a heavy wire up into a tree, and laying several radials on the ground, or elevated, radially out from the base of the tree (fig. 1C). The wire should be insulated unless it doesn't touch the tree: old coax is good for this: use the shield as the vertical element. A wooden tower or mast can serve as a support for the vertical element if no tree is handy.

Both the vertical element and elevated radials (if used) should be cut to a quarter wavelength long. Connect the coax shield to the point where all the radials join, and the center conductor to the bottom of the vertical element.

Length Equations for wire elements:

$L(\text{ft}) = 234/\text{frequency in MHz}$ (a quarter

wavelength in feet)
 $L(\text{m}) = 306/\text{frequency in MHz}$ (a quarter wavelength in meters)

Another relatively easy-up vertical is a vertically-mounted half-wavelength dipole (fig. 1D). The equation above gives the length to use for each half of the dipole. Connect the coax shield to the lower half of the dipole, and the center connector to the upper half. Bring the feed line away from the antenna at a right angle for as far as is practical.

If you can't mount your vertical antennas completely vertical then they can be put up at an angle. Then they are called a "sloper," and have some directivity in the direction toward which they slope.

◆ And So

The equations above will get you into the ballpark for element length. For reception on the HF and lower bands, tuning an antenna's length exactly to resonance is usually not necessary for satisfactory performance.

RADIO RIDDLES

Last Month

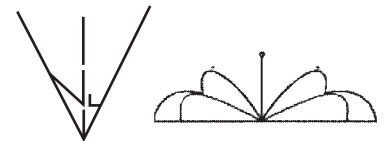
I asked: "Why don't antennas trust their

connectors?" Well, it's because those connectors are always feeding them a line. Really!

This Month

What kind of antennas are the following, and what do they have in common? Phantom, Dummy, and Mute.

You'll find an answer to this month's riddle, another riddle, another antenna-related web site or so, and much more, in next month's issue of *Monitoring Times*. 'Til then Peace, DX, and 73.



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Methodical Radio Restoration: 1. Starting up Your Project.

Last month we began work on the restoration of a National NC-57 after beginning, then terminating, a restoration of its predecessor in the National Company line, the NC-46. That one had open antenna coil primaries on three out of its four bands and I felt that the labor to remove and rewind them would not be justified for this particular set. I hasten to say that a person who loves this receiver and wants to add it to his collection could do this work. Antenna coil primaries contain relatively few turns and their specs are not critical.

Last month we took a careful first look at the NC-57, surveying the areas where further investigation and repair might be needed. However, I haven't advanced the project much since then. As frequently happens in early summer (when this is being written), outside home repair and maintenance projects commandeer my attention and cut into my bench time.

So what I thought I'd do this month is reflect on the many restorations we've completed since the start of this column and synthesize from those experiences an organized approach to beginning a radio restoration. As our regular readers know, restorations in this column are usually handled as case histories. Problems are solved as they come up, and the process is interesting and instructive. But now we'll take time to pull together some of what we've learned.

◆ The Cabinet

Before you remove the radio from its cabinet, you'll want to make notes about the cosmetic procedures to be undertaken. I'd recommend that you not consider stripping and re-



Cabinet top only was refinished during restoration of a Zenith 6S229 completed in the May, 2003 issue. Scratches elsewhere were treated by spot staining.

placing the entire finish except as an absolute last resort. Most original factory finishes are difficult or impossible to duplicate in a home workshop. Many wood grain effects were even created and applied by photographic processes.

Cleaning, touch-up staining and polishing can do wonders for rejuvenating a scratched wood finish. If the top has excessive scarring because it has been used as a shelf and/or is discolored by moisture leaking from potted plants, think about refinishing just that area with a closely-matching stain. Don't get hung up on trying for a result that looks mint. These are old radios. They look more convincing with a bit of age patina as long as it is apparent that they have been well cared for.

Communications receivers with metal cabinets can be approached in similar fashion. Do your best to keep as much of the original finish as you can. Carefully clean first – following up with a mild auto polishing compound on enameled surfaces. Be careful not to apply too much elbow grease around silk-screened markings. Consider touch-up spray painting with a carefully matched color on specific areas. Tired crackle finishes can be sometimes brought back to life by light application of a clear oil furniture finish. If repainting of areas is needed, light spraying can freshen the finish without losing the crackle effect.

Make notes about missing knobs, plastic dial covers, or other cabinet-related items so you can begin browsing for them at radio meets or on the internet. Take a look at the line cord. If it's a length of ancient rubber-covered wire, it is probably brittle and either already cracked or ready to crack when flexed. Cut it off right now and get it out of your way. You can replace it later after you begin electronic restoration.

As you dismantle the set for inspection, carefully store the hardware you remove. Most old radio hardware is a little unusual, if not unique, and hard to replace with authentic-looking substitutes. Don't hesitate to make notes about what goes where. I don't know how many times I've assumed that I would remember how the hardware went together, only to end up scratching my head during reassembly.

◆ Looking Inside

Before you get serious about evaluating the insides of your radio, equip yourself with the schematic and service notes. You may not have a full set of Rider's Manuals or Supreme Publications on hand, but there are many schematic sources that can supply the data for your set –

given the make and model number. Once again, the Internet will be a great resource for you. Try plugging the key words "radio schematics" into your browser.

As you inspect the chassis, place all your senses, particularly your eyes and nose, on full alert. The information you collect now can be key to help you diagnose problems that you'll have to deal with later.

Are there owner modifications? These are very common and easy to spot because of their amateur appearance. Use the schematic and your own intuition to determine what purpose they were intended to serve. Phonograph inputs, coax antenna connectors, and i.f. strip outputs for the connection of selectivity-enhancing equipment are often found. Get rid of these if you want to return your radio to stock condition.

Look for discoloration or other signs of electronic stress (such as a pungent smell or pools where wax or tar has run out) around parts such as the power transformer, power supply choke if present, electrolytic and paper capacitors, low-wattage and power resistors, etc. These will be symptomatic of problems that you will have to correct before powering up the set. Simply replacing the bad part is folly. Unless you uncover the cause of the original burnout, the new component will likely be quickly destroyed.

◆ Deal Breakers

Sometimes you'll find owner mods that are mindless and extensive – perhaps misguided attempts at repair or perhaps done for some purpose you'll never be able to figure out. Look for obviously foreign parts and crude soldering. Look for empty mounting holes where components have been removed. If the mods are very exten-



The power transformer, and other odd junk installed by previous owner, are included in this shot (from November, 2003 issue) of parts removed during restoration of a Hallicrafters S-40. The project would have been very difficult if a parts set hadn't been available.

sive, consider it a possible signal for you to put the set aside.

It might be more prudent for you to store that radio as a parts source for a better example that may turn up later. The problem here is that your schematic may not accurately reflect the design of the radio on your bench. It's not uncommon for there to have been undocumented changes made by the manufacturer to correct problems you will not be aware of. If any of these have been stripped out by the amateur "technician," you may never be able to restore the set to proper working condition.

Does the radio still look like a keeper? Check a couple more things before you decide to go ahead. If the set has a power transformer (in other words is not an a.c.-d.c. model), the condition of the transformer is key. Finding a replacement with a similar mounting style and proper electrical characteristics is a job that I, for one, would not choose to take on. I'd mothball a radio with a bad transformer unless I had a parts set available.

Install a new power cord if you need to, or rig a temporary replacement, and remove the rectifier tube. The latter step will prevent high-voltage d.c. from being introduced into the radio circuits – something you really don't want to happen just now. Plug in and turn on the radio. If there are glass tubes and you can see that they are lit, then the filament (or heater) winding of the transformer is ok. If the tubes are metal, then check with a VTVM (vacuum tube voltmeter) for the proper a.c. voltages at the filament or heater terminals of the tubes.

Also use the VTVM to check for proper voltage at the filament or heater terminals of the rectifier tube socket. The rectifier tube is lit from a separate power transformer winding. But make sure you don't put your VTVM across the plate terminals of the rectifier tube while it is set to read filament or heater voltage. There will probably be at least 600 volts there (which you also need to verify), and your meter will quickly be dispatched to never-never land if it is set for 10 volts or so. Check the voltage from each of the rectifier plate terminals to ground. In each case, it should be half of the voltage observed across the two plates.

If you are working with a radio (such as a communication receiver) that is ordinarily operated from an outside antenna rather than a built-in loop – then check the antenna coil primaries before beginning to undertake restoration. Even distant lightning strikes can induce damaging high voltages across the antenna terminals of an unprotected radio – frying the primaries.

Just put your VTVM on a low ohms setting and connect it across the two antenna terminal screws. (If one of these screws is strapped to ground, temporarily remove the jumper.) Now run the bandswitch through all of its positions. If there is no continuity at one or more of the positions, check the schematic to see if there is a capacitor present in series with the primary of the antenna coil(s) of the band(s) involved. Then verify its condition by replacing your ohmmeter with a capacitor checker. It should indicate the proper capacity.

It is sometimes feasible to rewind burned-out antenna coils if you like the radio enough

and have good reserves of patience. But in many cases, the job is all but impossible. In the case of the NC-57, for instance, the antenna coils are not discrete, but seem to be wound together on a common wax-impregnated form that is bristling with connections and buried deep within the radio. Forget it!

Keep an eye out for crumbling insulation around wires (very common if the insulation was rubber). These wires will have to be replaced, but if the condition is widespread, you might opt not to restore the set.

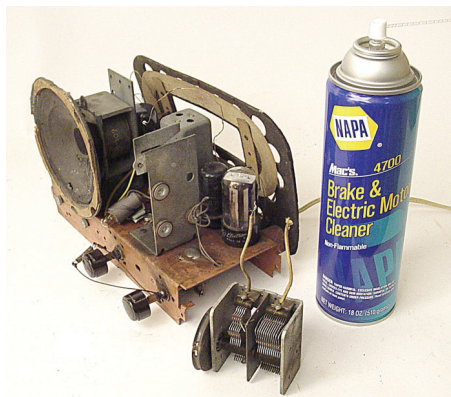
◆ Housekeeping Issues

If you've decided that your radio is a keeper, an appropriate next step would be to take care of basic housekeeping issues. Check all the tubes, making notes on any that are weak enough to need replacing. If more than one tube of the same type is used and one of them is weak, keep track of the socket it was originally installed in. The information could be diagnostically important later.

While the tubes are out of the set, remove any heavy deposits of dust and grime from the chassis. The tuning capacitor may have to be removed for cleaning if it is heavily dust-encrusted. You'll need an old-fashioned heavy-duty soldering iron to disconnect its grounding braid. The NAPA auto stores carry an inexpensive spray can of brake/electric motor cleaner that is excellent for such a cleaning job.

If the chassis has spots that are badly corroded, you might consider spot-sanding followed by painting the chassis with a quality metal coating in an appropriate color. The water-based metallic paints made by Modern Masters of N. Hollywood, CA are highly recommended.

This is also a good time to use contact cleaner/lubricant on potentiometers (you can usually spray it in through the opening around the terminal strip), bandswitches, and other controls with sliding contacts. Work each control thoroughly after you've applied the cleaner. Lightly spray all tube socket contacts with the cleaner, then remove and insert each tube a few times as you are reinstalling it.



The "Brake and Electric Motor Cleaner" sold by NAPA proved to be quite effective in cleaning the tuning capacitor of the "All American Five" set (from May, 2004 issue).

Watch for further installments of this "Methodical Approach" series that will be appearing from time to time!

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ICOM IC-R8500 Revisited

Let me tell you about an old friend, my ICOM IC-R8500 receiver. I first reviewed the IC-R8500 in January 1997 and have been using one ever since.

The reasons I prize the IC-R8500 include its wide frequency coverage, strong front end performance, variety of modes and bandwidths, and ease of computer control. It also interfaces nicely with accessory equipment.

I have reviewed other wide band, table top receivers, including AOR's AR-5000, AR8600, AR8600Mk2, and Yaesu's VR-5000. What struck me most about the IC-R8500 was its intermod immunity and build quality. Most radios which try to serve as both a shortwave receiver and VHF/UHF scanner are disappointing performers at one of the tasks. The IC-R8500 and AR-5000 I tested are two exceptions.

Wide Frequency Coverage

The IC-R8500 tunes 100 kHz up to 2000 MHz, but the USA consumer version skips the cellular phone ranges.

Several step increments from 10 Hz through 1 MHz are provided as standard and there is one programmable step of 0.5 - 199.5 kHz in 100 Hz graduations.

Modes and Selectivity

The IC-R8500 provides more modes and bandwidths than ordinary scanners or dedicated shortwave receivers. There are three bandwidths available for FM detection: 150, 12, and 5.5 kHz. The widest FM mode is used to receive broadcast stations and the other FM modes are appropriate for land mobile communications. The narrow 5.5 kHz FM bandwidth provides extra selectivity and audio recovery for narrow band signals, including the new 7.5 kHz VHF-high band channels and Family Radio Service. Satellite fans wish for a 40 kHz FM bandwidth, missing from the IC-R8500 and other receivers.

There is only one bandwidth for SSB, 2.2 kHz, and the same bandwidth is used for CW. I installed ICOM's extra cost 500 Hz CW filter, which is engaged in the CW Narrow position. The narrow filter makes it possible to monitor a single CW station nestled among others.

The IC-R8500 supports three different bandwidths for AM reception: 12, 5.5, and 2.2 kHz. Some AM foreign broadcast listeners value a selectable side band synchronous detector, a feature not found in the IC-R8500. Truth be told, I don't miss it for AM broadcast band monitoring.

A tunable audio peak filter provides audio selectivity with two bandwidths.



Memory, Scanning, and Searching

The IC-R8500's 1000 channels are initially organized into 20 banks of 40 channels each. A 100 channel skip bank is used to store frequencies to ignore during limit searches. Another 100 channel bank is reserved for finding active frequencies during auto searches.

You can change the number of channels in each bank by reallocating channels to and from a free pool. The skip and auto banks can be adjusted, too, a capability not documented in the user manual.

Each memory channel has flags for skip (lockout) and select, which are pertinent to scanning. An 8 character text label can be programmed for each memory channel and a 5 character label for each bank. Memory contents are retained in EEPROM so no backup battery is required. My IC-R8500 maintains its memory faithfully.

As covered in the original review, the IC-R8500 supports memory scanning. Though the memory banks are variable size, you can only scan one bank at a time. There are 10 pairs of frequency limits which can be used for limit searches, but you cannot chain search banks together.

An auto store facility automatically stores active frequencies found during a search into a special memory bank.

Accessory Jacks

As one would expect from a top of the line model, the IC-R8500 has jacks for accessories. I've used Hewlett-Packard spectrum analyzers connected to the 10.7 MHz IF output jack to view portions of the radio spectrum.

The bandwidth at the IF output jack is wide when the IC-R8500 is tuned above 30 MHz. I measured the frequency response at the IF output jack and graphed the results. The re-

sponse is within about 3 dB for 10 MHz wide window (5 MHz on either side of the center frequency). The IF circuitry attenuates signals further away, but affords a usable spectrum sample up to about 16 MHz wide.

The effect of the IC-R8500's AGC (automatic gain control) is visible on the spectrum display when the radio is tuned to, or past a strong signal. The AGC throttles back the receiver's sensitivity and attenuates all signals visible on a spectrum display. The same effect is true for ICOM's earlier IC-R7000 and IC-R7100A.

When observing weak signals across a band segment on a spectrum display, I make sure the IC-R8500 is tuned to a clear frequency. This prevents the AGC from reducing the radio's sensitivity.

The IC-R8500 rear panel includes a discriminator output jack, so there's no need to add one. I've used it with the CSI CD-1, CSI Flex Series, Optoelectronics DC440 and other CTCSS/DCS/DTMF displays.

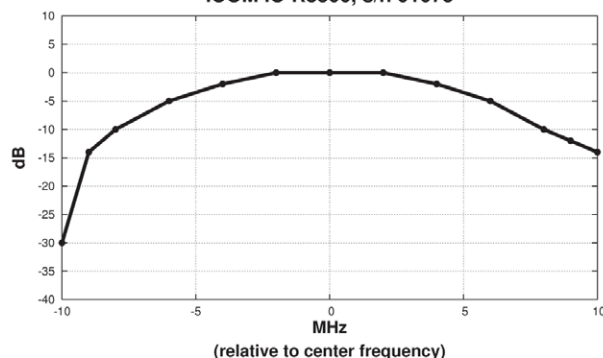
Construction

I remain impressed with the IC-R8500's build quality. A rugged, cast aluminum chassis is used to hold and shield the circuit boards. The boards contain additional shielded compartments. The attention to shielding helps reduce birdies, i.e., spurious signals produced within the receiver itself.

The radio remains cool during long periods of operation because ICOM furnishes an external power supply.

The main tuning knob is large and padded with rubber. The rubber keys are easy to operate and the lettering has not worn off after seven years of use.

10.7 MHz IF OUTPUT JACK
FREQUENCY RESPONSE
ICOM IC-R8500, s/n 01075



Performance

I measured an IC-R8500's sensitivity and graphed the results in the original January 1997 review. The radio is quite sensitive below 1400 MHz.

I purposely hunt for birdies, intermod, and signs of front end overload when testing receivers. Early on, my IC-R8500 was freer from spurious signals than the other radios I tried.

The difference in front end performance became even more obvious after the National Weather Service installed a new 162.4 MHz transmitter in the county. Strong NWR signals interfered with reception in several places in the VHF-high band with many of the review radios, but not the IC-R8500.

My IC-R8500 does receive some spurious signals above 1000 MHz, which I suspect is due to ICOM's implementation of a wide band converter for 1000+ MHz reception.

My IC-R8500's FM squelch action leaves room for improvement. The 50 millisecond long squelch tail is a little noisier than the shorter tail found some of the GRE-manufactured scanners, e.g., the PRO-2006 and PRO-2067.

When scanning, there is a brief delay before my IC-R8500 recognizes a signal present.

ICOM RS-8500 Software

Those who wish to control or configure their IC-R8500 using a computer now have several choices. Most of the software offerings require a computer running Microsoft Windows.

ICOM's own software, named RS-8500, works well, is simple to install and has excellent

graphics. It displays information in several separate windows, and the main window is a replica of the radio's front panel (March 1999 MT).

RS-8500's Band Scope window is a graphical portrayal of activity above and below the current frequency. Receiver audio is muted as the band scope sweeps. You can position the mouse over any part of the band scope and the IC-R8500 tunes instantly to the corresponding frequency.

RS-8500 software hoards user data. There is no print option and RS-8500 provides no way to import or export memory channels from a text or CSV (comma-separated values) file.

Free Tk8500 Software

I wrote tk8500 free, open source software for the IC-R8500 (April 2002 MT) after I switched from running Windows to Linux. Tk8500 runs on Linux, BSD, MacOS X, Windows, and other operating systems.

Tk8500 enables you to scan combinations of memory banks, overcoming the radio's limitation of single bank scanning. Memory data can be imported from and exported to CSV files, overcoming another limitation of the original ICOM RS-8500 software. Tk8500 may be downloaded freely from <http://parnass.com>.

Summary

The IC-R8500 is a flexible, wide coverage receiver with an outstanding front end. I have used it as both a monitor receiver and as a test instrument when repairing and aligning other radios. It snoops into corners of the spectrum that

simple scanners miss. I've even used it in SSB mode to monitor VHF ACSB conventional and trunked systems.

Though the IC-R8500 is not a trunk tracker, it has the most important features I need and is one of the few radios which performs well on both shortwave and VHF/UHF.

If I were forced to move to a tiny apartment and give up all receivers in my listening post except for one, the well-built IC-R8500 would stay.

Uniden Documents Computer Commands

Those who want to write receiver control software need to understand the computer interface commands supported by the receiver. It makes sense for a manufacturer to release this information to encourage software development, because a wide choice of software makes a receiver more attractive.

In a positive development, Uniden recently documented the computer interface commands (i.e. "control codes") for several model scanners. The command code documents may be downloaded as PDF files from <http://uniden.com>. The spoiler is that you must agree to the restrictions set forth in Uniden's six-page EULA (end user license agreement) before downloading the documentation from Uniden's web site.

In contrast, ICOM, Ten-Tec, and R. L. Drake document the interface commands for their tabletop receivers without a restrictive EULA.

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A Put-The-Pieces-Together Approach for Free

Last time we looked at a program called MixW version 2.12, which stands for "Mixture of different modes." A program that has a similar look and "feel" is HamScope version 1.54. The program is free but requires the user to go on an "egg hunt" to gather the support programs that make it work completely. All of the support programs are free and available from the Internet. All it takes is a little patience, web browsing and some download time. If you're up for it, let's check out HamScope.

◆ Getting HamScope

HamScope version 1.54 is available on a number of web sites including <http://www.qsl.net/hamscope/HamScope.html>. It downloads as a self-extracting file. The three resulting files can be unzipped to a location of your choice. Remember what folder you filed it in so that you can store the other required programs in the same folder.

According to the website, "HamScope is designed to run under Windows 98 and NT, and requires a 133 MHz Pentium-class or better machine. 16 bit SVGA color (or greater) is necessary for the panoramic waterfall display to function correctly. Users have reported that

HamScope generally works fine on Windows 95, ME, XP, 2000 ..." A sound card is required for decoding.

We used HamScope on an old HP Pavilion 3266 (Pentium I, 233 MHz PC with 98M of RAM) and an Icom IC-R10 handheld wideband receiver.

◆ Let The Hunt Begin!

HamScope acts as a control program, calling other programs to operate within itself. For example, to use HamScope for RTTY decoding you will need to download a program called MMTTY from <http://www.qsl.net/mmhamsoft/mmtty/index.html>. It is not clearly stated in the HamScope instructions that you must download MMTTY separately. I discovered it after a few hours of trying everything I could imagine, including other computers and earlier versions of HamScope. To be fair, if you go back to the website it does say that MMTTY must be installed with HamScope. MMTTY is a freeware program not requiring any cost for downloading and use.

In a similar manner, to decode HF or VHF Packet you'll need to download another piece of software. AGWPE is required and can be obtained without charge at <http://www.raag.org/>

sv2agw/inst.htm.

For station logging and rig control you will need a program such as TRX Manager, DX Base, LOGic 6 or one of the other six listed in the HamScope's website. We'll use a very capable program YPLog version 4.48 available at <http://www.members.shaw.ca/ve6yp/index.html>. The freeware, unregistered version is what we will use. A full operation registered version is available for \$50.

Now that our hunt has been successfully completed, let's see what HamScope can do.

◆ Configuring HamScope

When you start HamScope it will ask if you want to start your logging program. If you answer yes, and are using YPLog then, YPLog will open in a small window. Then HamScope's main screen will be displayed similar to Figure 1. Figure 1 is a fully operating and decoding HamScope screen. Upon initially running the program some areas will be blank.

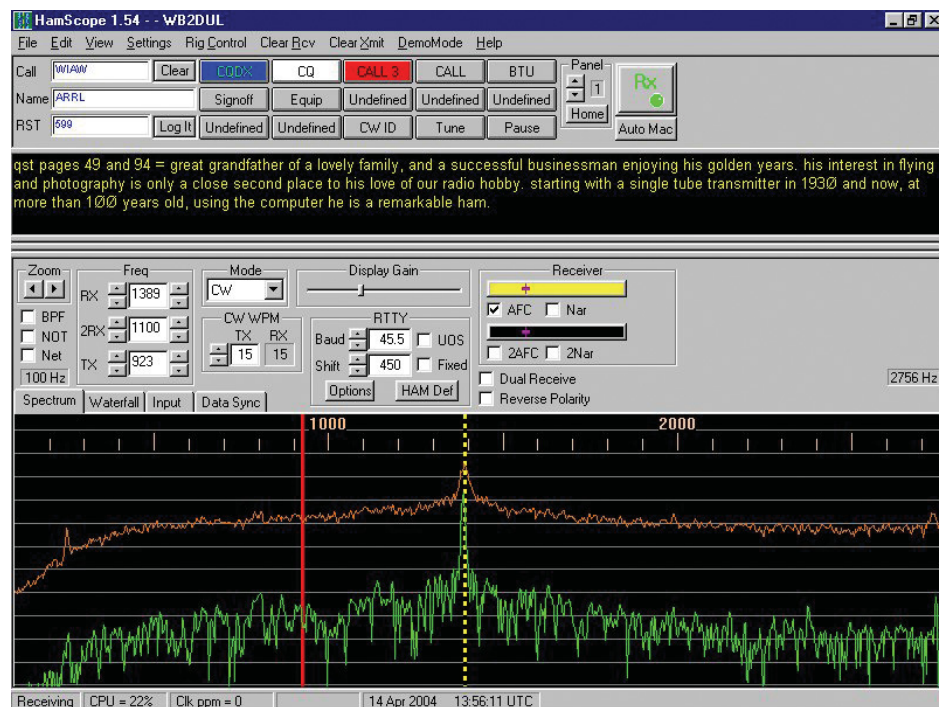


Figure 1 HamScope's Main Screen Shown Decoding a CW Signal

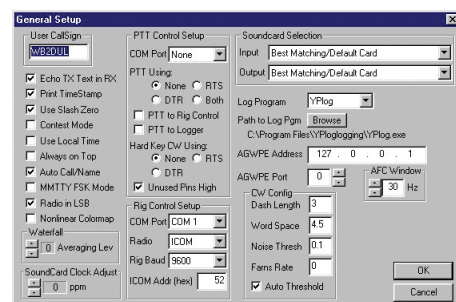


Figure 2 General Setup Screen Where HamScope Is Tailored To Your Equipment

Before we can use the program we must configure it to our specific equipment. Figure 1 shows that the HamScope screen is divided into a number of areas. Since we are only going to use the receiver portion of the program, we have chosen to remove the areas associated with the transmit function.

Look at the Command line at the top of the screen beginning with "File." By selecting "Settings" and then "General Setup," Figure 2 is displayed. Many parameters critical for the operation of HamScope are set from this screen.

Of first importance to us is the Rig Control Setup needed for computer control of the receiver. First we must tell HamScope to which serial port our receiver is connected in the Com Port box. We have selected Com 1. Next, choose the Radio we wish to control. Being directed primarily to hams, HamScope primarily lists

Kenwood, Yaesu and Icom transceivers. However, for both Kenwood and Icom radios generic control is possible.

◆ Our Radio Settings

Since our receiver was an ICOM R10 we selected "ICOM" in the radio box. The "COM Addr" (address) box then becomes active. Every computer controllable Icom radio comes from the factory with a preset address number. This can be found in your radio User's Manual. For the ICOM R10 the address is 52 in hexadecimal. The rate at which data is sent to the radio (baud rate) must also be set. Here we are using 9600 as suggested by Icom. Check your radio manual to find its baud rate requirements.

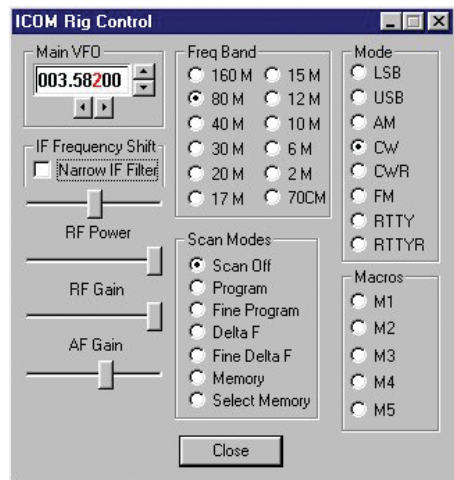


Figure 3 Rig Control Screen Showing the Frequency for W1AW's 80 Meter CW Station

◆ Support Programs Identified

Now that our radio interface is configured we must choose the logging program we are using. Here we have chosen YPLog and indicated its file location. Since we will be in a receive only mode we have set all push to talk (PTT) settings to "None" along with CW key input. You can see that HamScope has automatically determined the presence of the AGWPE program and put default values in for other settings. Using the "Settings" pull-down menu command at the top of the display, you can change these settings at any time.

◆ Using HamScope

The Amateur Radio Relay League (ARRL) in Connecticut operates station W1AW on various shortwave ham bands. These broadcasts include CW transmissions of text at increasing rates for use as code practice. Clicking on "Rig Control" in the command line brings up Figure 3. Here we have selected CW mode and typed in the frequency of 3.582 MHz, which is about W1AW's 80 meter transmission frequency.

Tuning is accomplished via the arrows around the "Main VFO" box in Figure 3. The horizontal arrows under the box are used to select the digital that you wish to tune. For example, we have chosen to tune in kilohertz steps by highlighting the "2" in our frequency. Then we use the up/down arrows on the side of the

box to tune around. You can see different "Scan Modes" that are possible for tuning in the box of the same name. It's a bit basic, but it works very well.

◆ Logging Even Easier

Let's look back to Figure 1. The area below and to the left of the Command Line, is where logging info is entered. We have entered W1AW as the call, ARRL as the name, and 599 as the RST numbers. Clicking the "LOG It" button to the right of the RST window brings up the complete logging screen, Figure 4. Much of the information displayed here has been automatically transferred.

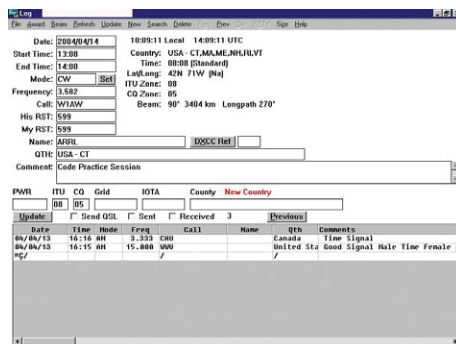


Figure 4 Logging Screen: Top Section Displays Details Current Logging

The top section of Figure 4 details the current station being logged. From the call letters, W1AW, the program has deduced the station's location country and the possible state. The "Comments" section can be used for intercept details. Other boxes are used for ham related information. For radio monitors, many of the ham-related info boxes can be removed by the choosing the "Size" command at the top of the screen. The "Preference" menu under the File command can be used to further customize the log.

At the bottom of Figure 4 is a summary listing of all loggings. Details of each logging can be displayed by left clicking on the entry of interest or by using the commands at the top of the screen. The log entries can be searched by call letters or text using the top Search command.

◆ Decoding CW

Let's look at the decoder control region of HamScope, which is the wide horizontal area in the middle of Figure 1. We have selected the CW mode. Audio notch and band pass filters are also provided and selected at the left side of this area.

The area below the decoder displays the audio output of the receiver, which is connected to the computer's sound card. It can be displayed in a number of ways. We have chosen the spectrum display. The CW tone of W1AW is shown at 1389 Hz under the dotted line. Dragging the dotted line with the mouse allows the user to decode a different nearby signal without retuning the radio. When used, the notch and bandpass filters' operating frequencies are set in a similar "drag and drop" manner.

The decoded text is displayed above the decoder control area where, in Figure 1, we can see the code practice text. The CW decoder eas-

ily produced readable text on most moderate-level signals.

◆ Decoding RTTY

Changing the mode of the decoder to RTTY displays new options. An oscilloscope-like tuning display appears on the right side of the Decoder control region. RTTY baud and shift setting boxes become active. HamScope takes the guesswork out of RTTY tuning.

In the RTTY mode the spectrum display indicates the mark, space and center frequencies with vertical lines. Once the center frequency line is dragged over the center of the incoming signal, the shift value can be easily determined and set. We tried the RTTY decoder and found it worked quite well, even with weak signals.

Although HamScope is also capable of decoding Packet, BPSK, QPSK and MSFK 16, we did not try these modes.

◆ Summary

One of the required programs in particular, YPLog, has a lot going for itself. It's simple, compact and deserves a look as a standalone control and logging program. It can control most Icom, Yaesu, TenTec or Kenwood radios. A free, limited-operation version is available on their website shown above.

With just a little bit of internet hunting for the support programs, HamScope v 1.54 ties together a nice package of receiver control, logging and decoding. It's easy to use and very useful for radio monitors as well as hams. Using the Icom R10, HamScope handled shortwave listening/decoding as well as VHF/UHF scanning duties. Since it is free, it's an excellent value for money. Why not give it a try?

Whoever said, "There is no such thing as a free lunch," didn't know about HamScope.

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Meteor Scatter

Communicating through 4.5 Billion Year Old Dust

By Michel Berlie-Sarrazin

Sounds interesting, doesn't it? But how can it be done? Well, a start might be reading this article introducing you to meteor scatter techniques.

◆ From Dust to Asteroids

What we commonly call shooting stars are not really stars. They are more or less large fragments of material (various metals and/or rocks) very often dating from 4.5 billion years ago, from the early stage of our solar system. Their sizes vary from dust particles only visible with the help of a powerful microscope up to the biggest ones such as the meteor responsible for the crater in Arizona.

Coming from deep space, their velocity is in the ten kilometer per second range or more. When they enter the upper layers of our atmosphere (80 to 120 kilometers high) they are sharply slowed down, and the friction raises their temperature from minus 270 centigrade degrees to thousands of degrees. At these values, their material combusts, which results in the creation of an ionized gas trail. The life of this trail is from few tenths of second up to one or two seconds, rarely one or two minutes. The length of the trail depends on the size of the meteor; average length is about 13 kilometers but it can get up to 50 kilometers. The velocity also plays a part in the density of the ionized gas.

◆ Best Frequencies

For the record, the ionospheric layers are made up of ionized gas as well. So it is possible to use the trails created by meteors as temporary radio-electric wave mirrors. These elusive reflectors are not omni-directional but directed along the trajectory of the fragment. A signal sent from the ground can illuminate a "receiving area" about 40 km long and 8 km wide somewhere else on the Earth at any distance from 100 km up to 2000 km.

Due to the most common size and density of the trails, certain frequencies are more suited than other ones for this use. They are in the upper limit of the HF band and into the VHF band. Trails are classified in two categories: underdense and overdense, with these consequences:

| Kind of trail | Optimum frequencies | Maximum possible trail life |
|---------------|---------------------|-----------------------------|
| Less dense | Above 100 MHz | 2 to 3 seconds |
| More dense | 30 MHz to 70 MHz | 2 minutes or more |

Tiny meteors with a minimum size of 0.15 mm are responsible for less dense trails. Meteors with a diameter of 5 mm generate long life, very

dense trails, but they are not as frequent as smaller ones.

As you can see, the 50 MHz and 144 MHz radio amateur bands are suited to meteor scatter practice. However, if we take into consideration other limiting factors (one of them being the level of galactical radio noise according to the frequency used), the theoretical best choice is 80 MHz.

◆ How to Determine Optimum Hours

The number of meteor impacts throughout a 24-hour period varies depending on the local hour. Maximum impacts occur around 06H00 and a minimum around 18H00, according to a sinusoidal curve in a ratio of 1 to 4 (on the Equator line, and decreasing towards both Poles).

A quick explanation: at 06H00 local hour, the zenith (directly over your head) is exactly facing toward the Earth's orbital movement and all the meteors located on the path are caught in Earth's atmosphere except for those with a higher velocity than the Earth. On the other hand, at 18H00 local time, the zenith above your head is facing away from the orbital path of the Earth and only the fastest meteors are able to catch up with our planet and enter its atmosphere. The relative velocity of the collision varies according to the same rule. It is just like your car – there are more insects squashed on your windshield than on the rear window.

This is not an occasional phenomenon, for around 50,000 meteors are trapped each second, but not all of them produce ionized trails.

According to various considerations (position of the Earth in relation to the ecliptic plane, its angle, the local hour, et cetera) here are some rules of thumb, valid for the northern hemisphere only.

| Azimuth of the radio electric circuit | Hours of transmission | Best path for optimal reception |
|---------------------------------------|-----------------------|---------------------------------|
| East – West | 06H00 | North side of the circuit |
| East – West | 12H00 | Both sides of the circuit |
| East – West | 18H00 | South side of the circuit |
| East – West | 24H00 | Both sides of the circuit |
| North – South | 06H00 | Both sides of the circuit |
| North – South | 12H00 | East side of the circuit |
| North – South | 18H00 | Both sides of the circuit |
| North – South | 24H00 | West side of the circuit |

◆ Your First Trial in Meteor Scatter Practice

Articles published in previous *Monitoring Times* (or *Satellite Times*) dealt with reception of FM stations as echoes from meteor trails, using a standard receiver. For example, you choose a free

Major Yearly Meteor Showers

| Showers | Duration | Peak |
|-------------|----------------|-----------|
| Quadrantids | Jan 1-6 | Jan 3 |
| Lyrids | Apr 19-25 | Apr 21 |
| Aquarids | May 1-20 | May 4 |
| Perseids | July 23-Aug 25 | Aug 11-12 |
| Orionids | Oct 16-27 | Oct 20 |
| Taurids | Oct 20-Nov 30 | Nov 5 |
| Leonids | Nov 15-20 | Nov 17 |
| Geminids | Dec 7-15 | Dec 14 |
| Ursids | Dec 17-25 | Dec 22 |

channel somewhere in the VHF FM band (if you can succeed in finding one in this overcrowded slice of spectrum), and from time to time you listen to fragments of programs (with more or less distortion) aired by distant stations normally out of reach. The period of the phenomenon depends on the life of the trail. When it is limited to a few hundredths of a second, you only hear a short burst called a "ping." The rate of appearance is linked to meteor activity. The larger yearly meteor showers are the best opportunities for a try.

Moving ahead, let us suppose that you want to listen to radio-amateur stations in a given azimuth. A small four element Yagi antenna is all you need, set at 45° above the horizon and pointing at the appropriate direction. If you prefer omni-directional service, just set the same antenna at 90° above the horizon (in other words straight to the zenith).

Unlike in moon-bounce communications, very huge arrays of antennas with tracking systems are not necessary for meteor scatter listening. But a good low-noise preamplifier may help reception, as signals can be very faint. If you are a radio amateur, your usual transceiver is enough, as well as a standard scanner (with SSB mode) if you are a listener.

◆ Communicating via Meteor Scatter

This time things become a bit more complex. With limiting factors such as the short life and random appearance of ionized trails, it is impossible to have recourse to usual CW or SSB. Only short SSB comms and very (not to say extremely) high speed

CW are suited to the circumstances.

Transmitting

Meteor scatter practices involve sending signals at speeds between 300 wpm to 1600 wpm (words per minute) to compensate for the duration of meteor trails as short as 0.1 second. This is

the only way to transmit a complete standard message in such a tiny slice of time.

With a manual keyer an amateur is able to send up to about 25 wpm, and with an electronic keyer (or with software) up to 80 to 100 wpm. Above this value, internal electronic circuitry at the key input of the transceiver begins to alter the signal excessively. So we have to turn to another input of this transceiver: its mike input (or data or AFSK input).

The principle is simple: we use high speed CW (HSCW) software or an external accessory to record our message and play it back at very high speed, by the means of a 2500 (or 2800) Hz pure frequency, modulated (signal on/off) according to spaces, dots and dashes. This is an injected audio tone mode. On the reception side, the signal is seen as a chopped carrier similar to a CW one.

Idiom Press (Box 1025, Geyersville, CA 95441, phone number 1 707 431 1286, <http://www.idiompress.com>, US\$ 55) offers a kit to assemble a programmable CMOS Super Keyer 3, with a built in B.F. tone generator and up to 1000 wpm speed ability.

An HF output power around 150 W is adequate, but if you have more power at your disposal do not hesitate to use it. However HSCW in QRP mode is also possible, when meteor scatter conditions are appropriate.

Receiving

Of course, it is absolutely out of question to decode HSCW (high speed CW) by ear. Actually, three main ways are possible: special recorders, modified or digital ones, and specific software.

Modified recorders are standard cassette recorders whose capstan motors are equipped with a variable speed drive. First, the recorder is plugged into the receiver and the tape is recorded at very high speed. After rewinding, the tape is played at a very low speed, allowing us to decode the signal. This solution is worthwhile up to 300 wpm.

If you slow down this analog tape by a x 15 reduction factor to get a 20 wpm speed (from a 300 wpm CW keying), the initial 2800 Hz tone is reduced to about 186 Hz, a rather low tone difficult to copy. And with a higher reduction factor, let us say x 30, the audio resulting tone will be about only 93 Hz. In such cases, it should be necessary to up-convert the audio tone to a higher pitch in the usual 300 to 800 Hz range for an easier CW hearing decoding. But in this last case it is simpler to use another solution altogether, such as the following ones.

The **digital tape recorder** is a special German-designed instrument only available in Europe. It is a purely electronic apparatus, where the physical magnetic tape is replaced with memory components as in the newest notepad voice recorders we already use. Naturally, the German product is fitted with special options: tone adjusting, speed reduction, signal marking, plug-ins dedicated to HSCW, etc. It is a good choice up to 1200 wpm.

There are 10 fixed speed reduction ratios. The x 30 reduction factor translates 800 wpm to 26 wpm. Another x 50 reduction factor converts 800 wpm into a 12 wpm speed very easy to decode. Three tone conversion rates (an up-converting process that is necessary to offset the sig-

nal speed lowering) are available.

Among many **HSCW software programs**, we can cite: **MSDSP** using your true Sound Blaster PC audio card to transmit and receive HSCW signals with a slowing down range peaking at x 180 times. **SBMS** is a receive-only software running under DOS or in a DOS window under Windows.

Cooledit (under Win 9.x) allows you to see CW dots and dashes (instead of hearing them) with the help of a kind of waterfall B.F. display on your PC screen, similar to other audio wave file editing programs. So it is a very interesting choice for hearing-impaired persons eager to practice HSCW.

Other possible choices, but only to transmit, are: **CWKey**, **PCKey** (DOS and Win 3.x), **K7CAW**, **MSSOFT** (with a shower peak prediction module). Most of these software programs give you access to very fast HSCW (1600 wpm, and even 3200 wpm).

Some other radio-amateur tips

To run HSCW software, a 486 processor is sufficient more often than not. Only a few programs need a Pentium processor (for example: **CoolEdit**).

A Yagi antenna is a good and sufficient aerial, to start with. Choose a medium size model (7 to 14 elements), put it up as high as possible, and use a good feedline (low loss type). Depending on geographical (distance between stations and their position on the earth), and astronomical (the radiant, or point in the sky from which the meteors appear to originate, UTC, etc.) conditions, raising or lowering the antenna may radically improve or damage the quality of the contact, as well as offsetting it with regard to the direct path.

Audio filters may or may not improve the signal to noise ratio of HSCW. Only tests "in the field" can help you decide.

Information cited in this section is drawn from files compiled by W8WN. We would particularly like to thank him for his permission to use them.

Professional Uses of Meteor Scatter

There have been a number of attempts to use meteor-scatter communications in commercial applications. Here are some examples from the US, Canada, and Europe.

In the 1950s the Boulder Laboratories of National Bureau of Standards (N.B.S.) set up three circuits:

The HF emitting power was 2 kW with 5 element Yagi antennas set at 2.4 l (electrical height) and 40° of elevation above the horizon. The data processing was made by

| Emitting site | Distance (km) | Receiving site |
|------------------------|---------------|-----------------------|
| Norman (?) | 1293 | Fargo (North-Dakota) |
| Long Branch (Illinois) | 1285 | Table Mesa (Colorado) |
| Barrow (Alaska) | 1222 | Kenai (Alaska) |

an IBM 650.

The N.B.S. also set up two other circuits: Sterling (Virginia) – Walpole (Massachusetts) (628 km), plus Erie (Colorado) – Kilbourne (Illinois) (1255 km). The frequency was 49 MHz, in FSK mode (600 to 4800 wpm).

In 1957 the US Air Force laboratories began to study the possibility of air – ground communications with the help of meteor scatter. They discovered that the better band was from 40 to 80 MHz with a range (500 to 2300 km) higher than on UHF. The advantages were numerous: no need for a directional antenna nor heavy equipment, transmissions by very short bursts, no need to change the frequency during the mission, and the VHF band is more immune to ionospheric disturbances than HF band. The messages were up to 20 characters (5 bits each) long. The mode was a special FSK (double channel AM, with "mark" and "space" 3.6 kHz apart, and a 2 kHz repetition rate). The final link speed was 2 kbits/s.

In 1953 the Radio Physics Laboratory of the Defense Research Board (Canada) set up two circuits: Port Arthur to Halifax (via Ottawa) and Port Arthur to Toronto, on 50 MHz, with output powers from 30 W to 300 W. AM double side band was preferred to NBFM or phase modulation to transmit data. Simultaneously, the AM carrier was used for the remote control signals of this automated system. This was called the JANET project.

In Europe, during the years 1965 and 1966, the SHAPE laboratories built on the JANET results for their COMET (COMMUNICATIONS through METEOR Trails) project. ARQ protocols on two

Audio Amplifiers You Can Build

...but not without the parts list! Our apologies for omitting this sidebar from the July "On the Bench" project!

| LM 386 AMPLIFIER | | | |
|------------------|-------|----------------------|-------------|
| R1 | 5k | Potentiometer | RS 271-1720 |
| R2 | 100R | Brown-Black-Brown | RS 271-1311 |
| R3 | 10R | Brown-Black-Black | RS 271-1301 |
| C1 | 1uf | Electrolytic | RS 272-1434 |
| C2 | .01uf | (marked 103) | RS 272-131 |
| C3 | 10uf | Electrolytic | RS 272-1025 |
| C4 | 100uf | Electrolytic | RS 272-1028 |
| C5 | .01uf | Disk capacitor | RS 272-131 |
| C6 | .01uf | Disk capacitor | RS 272-131 |
| C7 | 220uf | Electrolytic | RS 272-956 |
| 8 Pin Socket | | | RS 276- |
| 1995 | | | |
| U1 | LM386 | Audio Amplifier | RS 276-1731 |
| K81QY AMPLIFIER | | | |
| R1 | 10K | Potentiometer | RS 271-1721 |
| R2 | 180R | Brown/Gray/Brown | (junk box) |
| R3/4 | 47K | Yellow/Violet/Orange | RS 271-1432 |
| R5/6 | 2K7 | Red/Violet/Red | (junk box) |
| R7/8 | 220 | Red/Red/Brown | RS 271-1313 |
| C1 | .22uf | marked 223 | RS 272-1070 |
| C2 | 4.7uf | Electrolytic | RS 272-1024 |
| C3,4,5 | 470uf | Electrolytic | RS 272-1030 |
| C6,7 | 0.1 | marked 104 | RS 272-135 |
| T1 | | 1000CT:8 Transformer | RS 273-1380 |
| Q1,2,3,4 | | PN2222 (or equal) | RS 900-5420 |
| | | use RS 276-2009 or | |
| | | RS 276-2016 | |

frequencies (near 40 MHz and 100 MHz) were used. Space diversity, frequency diversity, and height diversity were tested, also.

More recently, the Forward Edge of Battle Area (F.E.B.A.) is another case of military application. With many transceivers located in the middle of the battle area and a main station far away from the enemy front, the meteor-based system is resistant to jamming and the transceivers (with their short burst transmission procedure) are very difficult to pinpoint.

We will not cover the SNOTEL network and similar ones like A.M.B.C.S. (Alaska Meteor Burst Communication System), as they were presented by Larry Van Horn in his "Fed Files" column published in the May 2000 issue of *Monitoring Times*.

❖ For Further Study

In the limited size of this article we have skimmed over these subjects. If you are very interested in meteor scatter and (or) HSCW, the first sources are the ARRL handbook, and ARRL antenna book (which cover design, measuring, tuning of aerials of all kinds).

Moreover, the HSCW world is a continually and quickly changing one. Technological successes build upon each other. So the Internet is your best up to date source to consult. Therefore, we mention some key Internet URLs we invite you to explore, and where you will find essential information and sound advice, software comparative-tests, download facilities, etc.

<http://www.n1bug.net/operate/hsms.html>
(HSCW, Meteor Scatter...)

<http://www.qsl.net/k0sm/ms.html>
(HSCW by the means of Sound Cards...)

<http://www.meteorscatter.net/>
(Meteor Scatter, Aurora, E sporadic layer, Tropospheric DX VHF, Solar Activity...)

http://www.nitehawk.com/rasmit/w1_15.html
(Meteors, HSCW, Meteor Scatter, Computer, Ham radio...)

<http://www.qsl.net/w8wn/hscw/hscw.html>
(HSCW, MSDSP, Meteor activity, Earth Moon Earth comms...)

http://www.members.tripod.com/~astro_electronic
(Windows or DOS freeware and software, and a simple electronic interface to buy or to make, allowing you to record meteor shower activity with your receiver or scanner and your PC computer...)

The above Web sites have a wealth of links to other ones, all at your disposal within reach of a mouse click.

❖ To Try

Just before you put this article down, allow me to make two last suggestions: meteor scatter and HSCW are wide fields of experimentation in themselves. But there is more to high speed CW than only meteor scatter. Think about all the other possible experimentation and applications: sporadic E, auroral propagation, tropospheric or ionospheric diffusion... And visual or photographic observations of meteors are interesting activities, also. The Perseids shower around August 11-12 is a great time to start.

MT REVIEW

Sirius vs XM: The AudioVox/SkyFi Faceoff

By Ken Reitz

When originally launched nearly four years ago, satellite radio was marketed mainly as a mobile option for your car. Most units sold were in-dash units in new cars with each service signing agreements with different vehicle manufacturers. The big problem was that once you parked the car your satellite radio was turned off until you got back into the car.

A more versatile option is to have a unit you can take with you when you leave the car and go into your house. A number of products are now available which allow you to do this with either service. Here is a look at two versatile look-alikes: The Sirius AudioVox and the XM SkyFi.

❖ Separate Twins

The Sirius AudioVox and XM SkyFi satellite radio receivers appear enough alike to be twins. But, side-by-side there's an obvious difference. The AudioVox is considerably bigger than the SkyFi, though the size of the LCD display screen on both is nearly identical. The extra bulk, however, hurts the

AudioVox when used in a mobile configuration; it's more awkward to mount and takes up extra space on already crowded dashboards.

Both are built on the same general design: the actual tuner may be slipped into the home or vehicle cradle and then popped out and taken with you. On the back of the home cradle there is a place to attach the lead to a small 2" x 2" antenna (XM and Sirius antennas, despite looking alike, are not compatible), a power cord jack and a mini-stereo jack which uses a mini to two RCA plugs to plug into an auxiliary jack in your home stereo.

The vehicle cradle is a little different. Several versions are available, including ones with FM modulators, auto stereo component plugs and cassette adapter. Some versions mount on your dashboard others underneath. Some have a cassette adapter, 12 volt power and RF adapter all in one. Check the most convenient configuration for your circumstances and think ahead a few years to when you may have a different vehicle. Shop for the best price from a variety of stores (see list) and check with the manufacturers' home pages, as there may be a manufacturer's re-



Programming Changes

Three big programming changes occurred earlier this year. Stung by Sirius' advantage with its commercial-free music channels XM followed suit in February of this year. Initial reaction by the stock market was negative but the joy subscribers felt was evident immediately.

The National Association of Broadcasters (NAB) fought furiously to stop both services from adding local traffic and weather reports to their line-ups. However, the FCC turned a deaf ear and one of the main criticisms of the service disappeared. Now, for most major markets in the U.S., it's possible to get the latest traffic and weather information without touching your car radio.

This spring XM launched XM America Left, a consortium of left-of-center commentators including professional gadfly Al Franken, environmental activist Robert F. Kennedy, Jr., comedienne Jeanene Garofalo and Hip-Hop artist Chuck D. Since its inception Sirius offered both sides via its Sirius Left and Sirius Right channels.

Sirius and XM satellite radio equipment is available from the following discount retailers:

Best Buy <http://www.bestbuy.com>
Circuit City <http://www.circuitcity.com>
Crutchfield <http://www.crutchfield.com>
Tweeter <http://www.tweeter.com>
Good Guys <http://www.goodguys.com>

Check out the home pages for possible manufacturer's rebates
 AudioVox: <http://www.audiovox.com>
 Delphi: <http://delphi.com>

bate available.

Both have 10 handy, front-mounted channel pre-sets which, in mobile use, are really useful. You may load more pre-sets into each, but the extra step in pushing buttons may lead to confusion and too much time with your eyes on the display and not on the road.

❖ Pros and Cons

- * The biggest difference between the two is subscription cost: Sirius: \$11.99/month, XM: \$9.99/month. When XM previously had commercials on most of its music channels the extra \$2/month was



well worth the cost to Sirius customers. But, since XM axed their commercials it's hard to justify the extra bucks for Sirius. Unless, of course, content is an issue [see side bar]. Per annum subscription cost goes down as you buy more years for either service, but I would hesitate to buy more than a one year's subscription. Sirius was offering a "lifetime" subscription for \$399, but it turns out that it's good only for the lifetime of the unit. A very dubious bargain.

- * A look at the channel line-ups may be all that's needed to tip the scale for you. For example: Sirius has a much wider scope of available news channels. It offers two channels of NPR and one of Public Radio International (both home to popular shows such as *A Prairie Home Companion*, *Car Talk* and *Wha'dya'know With Michael Feldman*). XM has none. Sirius also has a big plus for shortwave listeners: it carries World Radio Network and its complete line-up of international broadcasters.
- * I heard little difference between the two units when played through a variety of amplifiers. The better the stereo amplifier, the better either sounded. However, neither will sound as good as a CD played through a top quality stereo. Further, I found that compared with wide band satellite services such as DMX Direct, both units lacked depth and clarity. Still, while audiophiles might be disappointed, the point of satellite radio is portability (I certainly can't lug my dish around on my car) and content availability (it's great to listen to BBC World Service in the house and in the car).

- * I found the SkyFi remote control was more ergonomic and was able to access the tuner from a greater distance than the

AudioVox. It's also lighter weight, thanks to the small lithium 3 volt battery compared with the two AAA batteries in the AudioVox.

❖ In the Long Run

It's difficult to say how these units will hold up in the long run. My SkyFi and AudioVox units are both performing well after nearly a year's use. The Kenwood Sirius Here2Anywhere unit did not fare so well. It cratered after nine months and had to be replaced. Whichever you buy, be sure to keep the warranty info handy.

While XM hopes to reach the 3 million subscriber number by year's end and Sirius the 1 million level, the future of satellite radio is far from certain. Both continue to operate under enormous debt strain and while Wall Street analysts continue to rate both a "buy," investors should be concerned about their finances. Both have awarded Enron-style bonuses to their top people. Subscribers will want to see continued service enhancements or both services could go the way of the in-dash cassette.

NO TESTING REQUIRED!

Ham radio type repeater operation for the whole family without taking a test! A simple FCC part 95 GMRS license covers everyone in your household. No testing required, just a simple form that may be completed on the Internet.

Complete GMRS (UHF) repeater packages at discount prices. Also mobile, handy-talkies, base stations as well as commercial lines and antennas all available at discount prices. Licensing assistance available. Beldon coax, hard line, repeater and base station antennas.

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Garmin®'s Outstanding Rino® 130

It's a pleasure to have one's socks simply blown off by a piece of electronic gear that emphatically embodies excellence. The culprit responsible for my sockless condition is the Garmin Rino 130. It is so well thought-out and so well executed that it clearly sets a standard that other electronic firms can shoot for.

The 130 is the latest in Garmin's line of Rino (that stands for Radios Integrated with Navigation for the Outdoors) two-way radios with distinctive rhinoceros-like offset FRS and GPS antennas. The Rinos don't just integrate two-way radio with a Global Positioning System receiver into a slick handheld unit; they offer the unique ability to transmit your exact location to another Rino user and have it displayed on their GPS screen. Further – thanks to a recent FCC rule – with just the press of a button, you call “poll” all the Rino units in your area and have all their locations displayed on your screen.

You don't have to be Einstein to figure out that there are about 28 jillion uses for this capability: tracing the exact location of everybody on a search and rescue team; keeping track of folks in a car, RV, or bicycle caravan; locating and communicating with kids in a campground; spotting members of a climbing team; keeping your hunting or fishing party together, and on and on.

◆ FRS + GMRS + GPS + NOAA

The 130 is the Grandpa of the Rino Clan, and it incorporates more tricks than a magicians' convention. It features 22 two-way radio channels (14 that support Family Radio Service and 8 that support General Mobile Radio Service and GMRS repeater operation) and 38 squelch codes.

This is the only consumer-grade FRS/GMRS two-way radio that I am aware of that supports operation on GMRS repeaters. When you access the screen to turn on GMRS operation, the “operating system” reminds the user that a license is needed and a separate input is required to unlock the repeater operation. The location sending/polling features are disabled on these channels because it is prohibited by the FCC.

The 130 offers voice-activated transmission (VOX), vibration mode for silent call alerts and a voice scrambler for secure communications.

On the GPS side of things, the Rino 130 offers a detailed basemap of North and South America, displaying cities, highways, railways, rivers, lakes and borders. With 24 megabytes of internal memory, the Rino 130 can download detailed information, including topo maps, from optional CDs. The unit can store up to 500 waypoints, save up to 20 different tracks, and

run for 14 hours on three AA batteries. A built-in trip computer can track speed, time and distance.

The case is waterproof, and the Rino 130 incorporates an electronic compass and barometric altimeter. It also has seven channels to receive weather broadcasts from the National Oceanic and Atmospheric Administration, and has alert capability – which means it can be set to interrupt normal voice communications when NOAA broadcasts an alert. It comes standard with a belt

clip (a really good belt clip), a PC interface cable, owner's manual and quick-start guide.

◆ Operation

The face of the 130 is dominated by a 1.4" x 1.4" 160x160 pixel monochrome display with backlighting. Below that are three buttons: (from left to right) a volume button to open the volume control window; the thumb stick, which is used to enter options, move through lists, highlight fields, enter data and access the shortcuts menu; and the Z button which zooms the map and turns the electronic compass on and off. Below the buttons are the speaker and microphone.

On the left side of the unit are a Call button which polls other Rinos; a push-to-talk button, and the Page button, which cycles through the main pages of the interface. The On/Off button is on the top of the Rino 130 (between the “horns”!). On the right side is a headset connector with weather cap, and on the back are the belt clip connector mount, external power and data connector, and battery compartment access.

You would think that, with only six (count 'em!) buttons on the unit and so much capability packed inside, the Rino 130 could be a nightmare to operate, requiring arcane combinations to be pushed in sequence to access “secret” functions. Nothing could be further from the truth. In fact, I was able to activate most of the unit's important functions with only the briefest glance at the quick-start guide.

Only once was I stumped, and that was when the Shortcut Menu appeared, and I couldn't figure out why. But once you know the trick, it's easy: just press the Thumb Stick in and hold it – Voila! Shortcut Menu! Nevertheless, despite the ease of use, you will want to keep the well-written manual and quick start guides handy, for a while at least, to get the most out of the Rino.

The audio quality of the Rino 130s was outstanding on transmit and receive, and on my standard test course, the maximum range was also excellent, although one unit had the squelch set higher at the factory than the other (which made it more difficult for me to hear my wife, even though she could hear me fine).

The Rino 130 is an excellent unit, well conceived and well executed. SRP is \$374.99, with street price likely to be around \$350. But when you consider that a comparable GPS unit alone will set you back around \$300, the Rino 130 seems clearly worth it. For more information about Garmin products, visit <http://www.garmin.com>.



The Garmin Rino 130 integrates FRS/GMRS radio with a GPS receiver. You can transmit your exact location to another user to be displayed on their Rino screen, or you can poll all the Rino units in your area and see their locations on your screen.

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Frequency Coverage: 25.0000-512.0000 MHz., 806.000-823.9875 MHz., 849.0125-868.9875 MHz., 894.0125-956.000, 1240.000-1300.000 MHz.

When you buy your Bearcat 785D state-of-the-art Digital Capable TrunkTracker III package deal from Communications Electronics, you get more. The GV means "Great Value." With your BC785D scanner purchase, you also get a free deluxe scanner headset designed for home or race track use. The Bearcat 785D has 1,000 channels and the widest frequency coverage of any Bearcat scanner ever. When you order the optional BC125D, APCO Project 25 Digital Card for \$299.95, when installed, you can monitor Public Safety Organizations who currently use conventional, trunked 3,600 baud and mixed mode APCO Project 25 systems. APCO project 25 is a modulation process where voice communications are converted into digital communications similar to digital mobile phones. You can also monitor Motorola, EDACS, EDACS SCAT, and EF Johnson systems. Many more features such as S.A.M.E. weather alert, full-frequency display and backlit controls, built-in CTCSS/DCS to assign analog and digital subaudible tone codes to a specific frequency in memory, PC Control with RS232 port, Beep Alert, Record function, VFO control, menu-driven design, total channel control and much more. Our CEI package deal includes telescopic antenna, AC adapter, cigarette lighter cord, DC cord, mobile mounting bracket with screws, owner's manual, trunking frequency guide and one-year limited Uniden factory warranty. For maximum scanning enjoyment, operate your scanner from your computer running Windows. Order Scantool Gold for Windows, part number SGFW for \$99.95 and magnetic mount antenna part number ANTTMBNC for \$29.95. Not compatible with 9,600 baud APCO digital control channel with digital voice, AGEIS, ASTRO or ESAS systems. For fastest delivery, order on-line at www.usascan.com.

Bearcat® 895XLT Trunk Tracker
Manufacturer suggested list price \$499.95
Less - \$320 Instant Rebate / Special \$179.95
300 Channels • 10 banks • Built-in CTCSS • S Meter
Size: 10 1/2" Wide x 7 1/2" Deep x 3 3/8" High
Frequency Coverage: 29.000-54.000 MHz., 108.000-174 MHz., 216.000-512.000 MHz., 806.000-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

The Bearcat 895XLT is superb for intercepting trunked analog communications transmissions with features like TurboScan™ to search VHF channels at 100 steps per second. This base and mobile scanner is also ideal for intelligence professionals because it has a Signal Strength Meter, RS232C Port to allow computer-control of your scanner via optional hardware and 30 trunking channel indicator annunciators to show you real-time trunking activity for an entire trunking system. Other features include Auto Store - Automatically stores all active frequencies within the specified bank(s). Auto Recording - Lets you record channel activity from the scanner onto a tape recorder. CTCSS Tone Board (Continuous Tone Control Squelch System) allows the squelch to be broken during scanning only when a correct CTCSS tone is received. For maximum scanning pleasure, order the following optional accessories: PS001 Cigarette lighter power cord for temporary operation from your vehicle's cigarette lighter \$14.95; PS002 DC power cord - enables permanent operation from your vehicle fuse box \$14.95; MB001 Mobile mounting bracket \$14.95; EX711 External speaker with mounting bracket & 10 feet of cable with plug attached \$19.95. CAT895 Computer serial cable \$29.95. The BC895XLT comes with AC adapter, telescopic antenna, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, EDACS, ESAS or LTR systems.



Bearcat® 245XLT Trunk Tracker II

Mfg. suggested list price \$429.95/CEI price \$189.95

300 Channels • 10 banks • Trunk Scan and Scan Lists
Trunk Lockout • Trunk Delay • Cloning Capability
10 Priority Channels • Programmed Service Search
Size: 7 1/2" Wide x 1 3/4" Deep x 6" High
Frequency Coverage:

29.000-54.000 MHz., 108-174 MHz., 406-512 MHz., 806-823.995 MHz., 849.0125-868.995 MHz., 894.0125-956.000 MHz.

Our Bearcat TrunkTracker BC245XLT is the world's first scanner designed to track Motorola Type I, Type II, Hybrid, SMARTNET, PRIVACY PLUS and EDACS® analog trunking systems on any band. Now, follow UHF High Band, UHF 800/900 MHz trunked public safety and public service systems just as if conventional two-way communications were used. Our scanner offers many new benefits such as Multi-Track - Track more than one trunking system at a time and scan conventional and trunked systems at the same time. 300 Channels - Program one frequency into each channel. 12 Bands, 10 Banks - Includes 12 bands, with aircraft and 800 MHz. 10 banks with 30 channels each are useful for storing similar frequencies to maintain faster scanning cycles or for storing all the frequencies of a trunked system. Smart Scanner - Automatically program your BC245XLT with all the frequencies and trunking talk groups for your local area by accessing the Bearcat national database with your PC. If you do not have a PC simply use an external modem. Turbo Search - Increases the search speed to 300 steps per second when monitoring frequency bands with 5 KHz. steps. 10 Priority Channels - You can assign one priority channel in each bank. Assigning a priority channel allows you to keep track of activity on your most important channels while monitoring other channels for transmissions. Preprogrammed Service (SVC) Search - Allows you to toggle through preprogrammed police, fire/emergency, railroad, aircraft, marine, and weather frequencies. Unique Data Skip - Allows your scanner to skip unwanted data transmissions and reduces unwanted birdies. Memory Backup - If the battery completely discharges or if power is disconnected, the frequencies programmed in your scanner are retained in memory. Manual Channel Access - Go directly to any channel. LCD Back Light - An LCD light remains on for 15 seconds when the back light key is pressed. Autolight - Automatically turns the backlight on when your scanner stops on a transmission. Battery Save - In manual mode, the BC245XLT automatically reduces its power requirements to extend the battery's charge. Attenuator - Reduces the signal strength to help prevent signal overload. The BC245XLT also works as a conventional scanner. Now it's easy to continuously monitor many radio conversations even though the message is switching frequencies. The BC245XLT comes with AC adapter, one rechargeable long life ni-cad battery pack, belt clip, flexible rubber antenna, earphone, RS232C cable, Trunk Tracker frequency guide, owner's manual and one year limited Uniden warranty. Not compatible with AGEIS, ASTRO, ESAS or LTR systems. Hear more action on your radio scanner today. Order on-line at www.usascan.com for quick delivery. For maximum scanning satisfaction, control your Bearcat 245XLT from your computer running Windows. Order Scantool Gold for Windows, part number SGFW for \$99.95 or the surveillance enhanced version with audio recording part number SGFWSE for \$159.95.



More Radio Products

Save even more on radio scanners when purchased directly from CEI. Your CEI price after instant rebate is listed below:

| | |
|--|----------|
| Bearcat 895XLT 300 ch. TrunkTracker I base/mobile scanner..... | \$179.95 |
| Bearcat 785D 1,000 channel TrunkTracker III base/mobile..... | \$339.95 |
| Bearcat BC125D APCO Project 25 digital software card..... | \$299.95 |
| Bearcat 278CLT 100 ch. AM/FM/SAME WX alert scanner..... | \$139.95 |
| Bearcat 250D 1,000 ch. TrunkTracker III handheld scanner..... | \$339.95 |
| Bearcat 245XLT 300 ch. TrunkTracker II handheld scanner..... | \$189.95 |
| Bearcat 248CLT 50 ch. base AM/FM/weather alert scanner..... | \$84.95 |
| Bearcat Sportcat 200 alpha handheld sports scanner..... | \$159.95 |
| Bearcat Sportcat 180B handheld sports scanner..... | \$139.95 |
| Bearcat 80XLT 50 channel handheld scanner..... | \$99.95 |
| Bearcat 60XLT 30 channel handheld scanner..... | \$74.95 |
| Bearcat BCT7 information mobile scanner..... | \$139.95 |
| AOR AR16BQ Wide Band scanner with quick charger..... | \$199.95 |
| Sangean AT5909 306 memory shortwave receiver..... | \$209.95 |
| Sangean AT5818 45 memory shortwave receiver..... | \$139.95 |
| Uniden WX500 Weather Alert with S.A.M.E. feature..... | \$39.95 |



AOR® AR8200 Mark IIB Radio Scanner

AOR8200 Mark IIB-A wideband handheld scanner/SPECIAL \$539.95

1,000 Channels • 20 banks • 50 Select Scan Channels
PASS channels: 50 per search bank + 50 for VFO search
Frequency step programmable in multiples of 50 Hz.
Size: 2 1/2" Wide x 1 3/8" Deep x 6 1/8" High
Frequency Coverage:

500 KHz to 823.995 MHz, 849.0125-868.995 MHz, 894.0125-2,040.000 MHz
(Full coverage receivers available for export and FCC approved users.)

The AOR AR8200 Mark IIB is the ideal handheld radio scanner for communications professionals. It features all mode receive: WFM, NFM, SPM (Super Narrow FM), WAM, AM, NAM (wide, standard, narrow AM), USB, LSB & CW. Super narrow FM plus Wide and Narrow AM in addition to the standard modes. The AR8200 also has a versatile multifunctional band scope with save trace facility, twin frequency readout with bar signal meter, battery save feature with battery low legend, separate controls for volume and squelch, arrow four way side rocker with separate main tuning dial, user selectable keypad beep/illumination and LCD contrast, write protect and keypad lock, programmable scan and search including LINK, FREE, DELAY, AUDIO, LEVEL, MODE, computer socket fitted for control, clone and record, Flash-ROM no battery required memory, true carrier reinsertion in SSB modes, RF preselection of mid VHF bands, Detachable MW bar aerial. Tuning steps are programmable in multiples of 50 Hz in all modes. 8.33 KHz airband step correctly supported, Step-adjust, frequency offset, AFC, Noise limited & attenuator, Wide and Narrow AM in addition to the standard modes. For maximum scanning pleasure, you can add one of the following optional slot cards to this scanner: CT8200 CTCSS squelch & search decoder \$89.95; EM8200 External 4,000 channel backup memory, 160 search banks. \$69.95; RU8200 about 20 seconds chip based recording and playback \$69.95; TE8200 256 step tone eliminator \$59.95. In addition, two leads are available for use with the option socket. CC8200A personal computer control lead \$109.95; CR8200 tape recording lead \$59.95. Includes 4, 1,000 mAh AA ni-cad batteries, charger, cigarette lighter adapter, whip aerial, MW bar antenna, belt hook, strap and one year limited AOR warranty. For fastest delivery, enter your order on-line at <http://www.usascan.com>.



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What's NEW

Tell them you saw it in Monitoring Times

OptoElectronics X-Sweeper

The new X Sweeper is a sophisticated near-field receiver with a graphical display that displays the near-field RF (analog only) in a spectrum format, allowing the user to rapidly observe all signals that are present, not just one single frequency at a time. Once a signal is received, the X Sweeper demodulates the FM audio through its built-in speaker.



With a frequency range of 30MHz - 3GHz, the X Sweeper can sweep and lock onto a broad range of frequencies in a matter of seconds. The 25 button keypad allows easy access to all functions, provides a direct numerical entry for the center frequency of the sweep range to be easily selected, and easily tunes to a specific frequency in VFO mode. An optional GPS receiver can be added to tag latitude and longitude along with the captured frequency.

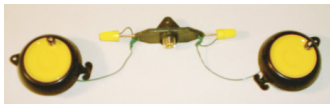
For more details on this unique model from Optoelectronics, please visit: <http://www.optoelectronics.com/xsweeper.htm>

The X-Sweeper is available from Optoelectronics at 5821 NE 14th Avenue, Ft Lauderdale, FL 33334; 800-327-5912, for \$1599; GPS is an additional \$249. Opto products are also available in Canada from Radio HF, P.O. Box 67063-Lemoyne, St. Lambert, Quebec J4R 2T8 Canada; (450) 671-3773; Canada only: 1-800-463-3773;

radiohf@sympatico.ca or <http://www3.sympatico.ca/radiohf>

Yo-Yo-Vee

A new portable antenna from DWM Communications gets its name not because it's up and down in a snap (which it is), but because its wind-up antenna reels resemble a toy yo-yo. When deployed the Yo-Yo-Vee forms an inverted Vee antenna. The antenna wire is #22 annealed multi-strand copper wire with PVC insulation which is reeled out to suit the band of operation needed.



The Yo-Yo-Vee covers 2 through 40 meters, one band at a time, or you can configure the antenna for multiband operation by adding reels. DWM also sells the antenna in dual band and tri-band configurations. However, additional reels must be purchased to cover 60-80 or 160 meters. The Budwig center insulator makes it easy to attach your PL-259 coax connector feedline.

For emergency and portable operation, you can't get much smaller or simpler. Watch for a review in *MT* coming up soon.

The basic Yo-Yo-Vee is \$39.95 plus \$7.95 s/h in the U.S. The Dual Bander is \$49.95, or the Tri-bander is \$59.95. Additional reels are \$14.95 each. To order call DWM Communications at (517) 563-2613; visit <http://qth.com/dwm>; or send to DWM Communications, PO Box 87, Hanover, Michigan 49241.

Grove Military Frequency Directory

By Larry Van Horn

Larry Van Horn completely revised the format of this CD-ROM making it much easier to read via the computer screen than the previous edition. Pages are set up in landscape format (11 inches width & 8-1/2 inches length), a more legible format than the first edition. The entire publication is in Acrobat format and the Adobe Reader version 6 is provided on the CD to view or print the pub-

lication.

If you were to print out the directory (which I did) it would be 764 pages - a 5-inch stack of paper, tough to get into a 3-ring binder (using a thin document protector to divide each state).

The contents of the Directory are as follows (with my additional comments).

TABLE OF CONTENTS - Basically, you click on the appropriate title and the software takes you to that appropriate page. Individual pages are numbered but the table of contents doesn't indicate the page numbers for the titles.

HOW TO USE THIS GUIDE (pages 3 - 12) - Provides helpful information on listening to milcom both aero and ground related, as well as many common aero & ground frequencies to include trunking systems. It's a very good review for the experienced listener and extremely helpful information to the newcomer.

SERVICE LEGEND (pages 13 - 18) - This provides both the abbreviations for services and miscellaneous acronyms utilized throughout the publication.

UNITED STATES LISTINGS:

NORAD (pages 19 - 21) - With the '9/11' aftermath came the start of random and specific activities air protection patrols/air combat patrols; listed here are the common frequencies for the five NORAD sectors as well as past air tactical frequencies active during air protection patrols in three of the sectors.

MILITARY COMMUNICATIONS SATELLITE BAND PLANS (pages 21 - 48) - Basically if it's a military satellite system (narrow & wide band systems, various transponders) it's here; the frequency as well as channel numbers are listed.

STATE LISTINGS (pages 49-728) - Each State (50) and the District of Columbia (1) has separate pages. The smallest listing is Wyoming (3 pages) and the largest is California (73 pages). Within each state listing the following format is utilized:

Statewide - Includes (where applicable) Land Mobile Frequencies as well as Flight Operation Frequencies. Land Mobile systems are primarily assigned to the Army National Guard (e.g. emergency & contingency nets). Flight Ops are air/air tactical which also are ARNG.

Air Route Traffic Control Center(s) - each location & frequencies (VHF/UHF) as well as

usage for these FAA facilities.

Various Civilian Airports / Military Training & Operating Areas/ Military Bases (in alphabetical order)

HF Radio Frequencies (if applicable): HF SSB/ALE listings

Land Mobile Radio Frequencies (if applicable) include listings for such functions as: base commander's net, public works, fire, police, aircraft maintenance, aircraft parking, communications maintenance, transit/transportation, emergency coordination and many other nets associated with providing both base/community as well as mission support. Additionally, approximately 120 Trunked Radio Systems are listed, primarily in the UHF band, with complete information being listed on some systems (e.g. system locations, frequencies, offsets, talk groups, talk group users). Other systems have not been built yet so information is limited.

Flight Operations Frequencies (if applicable) include: FAA related air traffic control (e.g. approach/departure control, ground control, tower, ATIS), mission support (e.g. base operations, base weather (metro), base/unit command posts) and tactical air/air air/ground systems & some aerial refueling frequencies.

OVERSEAS LISTINGS:

This new addition also includes some overseas listings (pages 729- 741) most of which are limited to Flight Operations type frequencies and some HF frequencies. Countries include: Ascension Island, Antigua, Australia, Bahamas, Belgium, Bermuda, Canada (Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Prince Edward, Quebec, & Saskatchewan), Europe (aerial refueling, Combined Endeavor XX Radio Relays, NATO), Germany, Guam, Honduras, Italy, Japan, Netherlands, Puerto Rico, & United Kingdom.



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What's NEW

Tell them you saw it in Monitoring Times

SPECIAL FEATURES:

As a bonus & separate access the CD-ROM includes a copy of official US government military flight information publications/documents to include: General Planning Manual, Flight Information Handbook, Area Planning, Special Use Air Space, Military Training Routes & DOD Flight Information Publications. All of these special feature publications are available for free download but the time to download these publications would range from approximately 1 hour (for a high speed cable/dsl connections) to over 6 hours for a 56 kp modem dial up.

Conclusion:

This frequency directory is a "must have" for anyone who is actively involved or considering trying military communications (milcom) monitoring. This is a very concise directory that will point you in the right direction for getting the most pleasure out of milcom monitoring with the minimum effort.

The *Grove Military Frequency Directory* is \$39.95 plus shipping from Grove Enterprises, 7540 Hwy 64 West, Brasstown, NC 28902; 800-438-8155; <http://www.grove-ent.com>

— Ken Windyka, Springfield
Massachusetts Monitoring Area

Domestic Broadcast Survey 6

With the onset of DX season nearing, every true DXer should take notice. The 6th Edition, *Domestic Broadcasting Survey* has recently become available.

Edited by Anker Petersen (Chairman, *Danish Shortwave Club*), the DBS-6 has become the most trusted aid for those who revel in the tropical and domestic shortwave scene. In fact, as with other editions, it far exceeds other annual hobby publications.

As in the past, *DBS-6* remains a very easy guide to follow. Information is arranged by frequency, followed by power, county, station, and operation schedules. To assist in identifying a station, many slogans as well as alternate identifying factors are included, as well as parallel frequencies.

The "Last Log" column lists

when the station was last heard just prior to the *DBS* publishing deadline, which makes a great aid to ensuring accuracy. As with previous editions, former frequencies not monitored in the last year are deleted, but compiled at the end of the survey.



The *Domestic Broadcast Survey-6* once again is ultimately the best source for those DXers seeking the extra edge to their hobby. It is very useful, accurate and a valuable reference. For a sample page and the Press Release, consult their website at <http://www.dswci.org/>

The survey is available in electronic form in pdf format via email for \$7.00 US dollars, Europe 5, or 6 IRCs. The print edition is available for \$13.00 US dollars. Either can be ordered from the club treasurer. For additional ordering information and guidelines, consult the website or write to: DSWCI, c/o Bent Nielsen, Egekrogen 14, DK-3500 Vaerloese, Denmark.

The *Domestic Broadcast Survey* is a "must-have" source for the truly dedicated hobbyists. I cannot imagine DXing without this valuable aid!

— Gayle Van Horn

Electronic Gadgets for the Evil Genius

By Bob Iannini

Most of us techie types gape in wonder at the huge sparks from Tesla coils and Jacob's ladders as featured in the old Frankenstein movies; we are awed by magnetic rail guns and laser rays; we are stunned by anti-gravity levitating platforms; and we are titillated by distant-focus listening devices that can monitor conversations through windows. But with a little patience, some technical savvy, and a new book from McGraw Hill, the skilled experimenter can build these devices and more from scratch – most of them for under \$100!

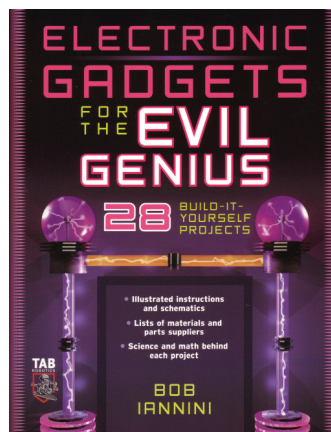
Iannini's new book provides detailed construction plans for 28 such projects, including parts sources

where necessary. It is expected that the reader provides the technical understanding. *Gadgets* is not for the timid tinkerer – some of these powerhouse projects operate with lethal voltages, and pack a wallop in other ways as well!

Pyrotechnic blasters, electromagnetic-pulse (EMP) crushers, ion ray projectors, sonic phaser cannons, ultrasonic shock projectors, working light sabers, multivortex plasma tornadoes – you can bring Hollywood special effects to your own workshop! But be careful!

Electronic Gadgets for the Evil Genius is \$24.95 from your favorite book store. For more information or ordering direct, visit the McGraw Hill web page: <http://books.mcgraw-hill.com/cgi-bin/pbg/0071426094>.

— Bob Grove

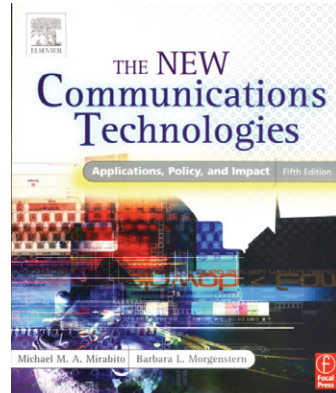


The New Communications Technologies

By Mirabito/
Morgenstern

The new Fifth Edition of *The New Communications Technologies* by Michael Mirabito and Barbara Morgenstern is not your average textbook on how technology works. Rather, as its subtitle states, its focus is on the "Applications, Policy and Impact" of emerging modes of communication.

The book explores the new communications technologies and covers topics ranging from multimedia and production to satellites to digital communication. Equally important, the book examines the so-



cial, economic, and political impact brought about by the adoption of such technologies and applications; this fallout includes privacy concerns, First Amendment issues, and the implications raised by biometric systems

Legal discussions play a large part in the book, with topics ranging from First Amendment issues to copyright and privacy – including implications of anti-terrorist legislation. One statement, repeated both in the Preface and in the Afterword of the book, will resonate with radio hobbyists – the notion that "the same tools used to protect our freedom have the potential to curtail our freedom."

Although the book is directed toward technology courses in TV/Radio, communication, journalism, public relations/advertising, legal and other courses, it makes for interesting, thought-provoking reading. The research material at the end of each chapter could keep you busy for years!

The New Communications Technologies (ISBN: 0-240-80586-0) is 331 pages, paperback, and can be purchased for \$34.95 from Elsevier Press (<http://elsevier.com>) or check it out at your local library.

— Rachel Baughn

Books and equipment for announcement or review should be sent to "What's New?" c/o Monitoring Times, 7540 Highway 64 West, Brasstown, NC 28902. Press releases may be faxed to 828-837-2216 or emailed to Rachel Baughn, editor@monitoringtimes.com

Weather Satellite Reception - Easy to Advanced

It is now a relatively low cost experience to set up equipment to receive the basic low resolution image transmissions from three NOAA polar orbiting satellites, and one or two (depending on your location) geostationary satellites. These satellites have so much to offer that it seems a pity to let their transmissions go to waste!

Assuming that you already have a computer fitted with a soundcard, the only reception hardware that you require is an antenna and suitable receiver. NOAAs-12, 15 and 17 (see the list at the end of this column) transmit in the 137 MHz band, and their signals are optimized for right-circularly polarized antennae.

The most commonly used type of WXSAT antenna is probably the crossed-dipole, though variations are many. Mount it well off the ground, pointing upwards, and connect to a receiver. Although a utility receiver tuned to 137.5 or 137.62 MHz will hear the satellites several times per day, a purpose-designed WXSAT receiver is so much better – allowing all the image signal bandwidth (about 35-40 kHz) to pass through, rather than just the 15 kHz of a typical communications receiver.

The audio output from the receiver can be fed into your computer's soundcard – but that is for another month!

❖ Special Effects

We have come a long way since the time when WXSAT images could only be displayed in 16 shades of grey! Now we have realistic color at the click of a mouse, and some software goes further than that – simulating 3-dimensional images!

An anaglyph is a moving or still picture consisting of two slightly different perspectives of the same subject – WXSAT images in this instance – made in contrasting colors superimposed on each other. They produce a three-dimensional effect when viewed through two correspondingly colored filters. Some recent software, such as *WXtoimg*, includes – in the registered version – the production of anaglyph images.

Chuck Vaughn has occasionally posted some anaglyph images on his web site, and recently went a stage further. He has been using high resolution images (HRPT) from both NOAA and FENGYUN WXSATs to produce unusually large scale anaglyphs. Chuck explained: “NOAA-15 and FY-1D had well situated passes an hour apart on May 30 that provided a good anaglyph making opportunity. I went a bit further than normal and made three, one each from channel-1, channel-2 and channel-4. Previously I had always used channel-2. I didn't know if an

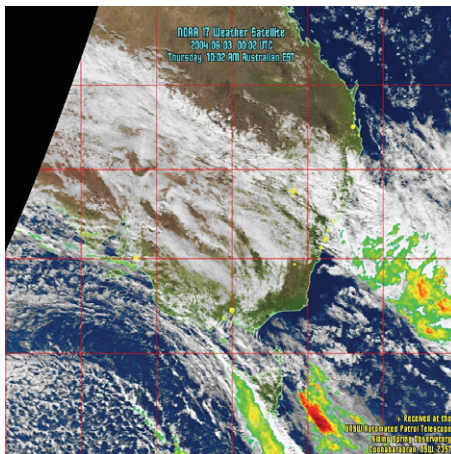


Fig 1: NOAA-17 APT image after processing by Siding Spring observatory, Australia (see text)

Figure 1 was produced by the UNSW Automated Patrol Telescope at Siding Spring observatory, Coonabarabran, NSW, Australia. Processing of the APT image was done by WXtoimg, and shows the 'msa-precip' type image (multi-spectral analysis indicating rain).

anaglyph could be made with an infrared image, but it worked.”

To view these images as intended, you require the blue-red glasses usually used for this purpose. Chuck notes that the “channel-1 anaglyph shows the mountains to be heavily vegetated, while channel-2 shows the best land details. Channel-4 shows the mountain ridges to be colder than the valleys between them.”

Chuck explained that you need a ‘left’ and ‘right’ version of the same area to make an anaglyph. For best results, you need HRPT data imaged from the west and from the east of the area. This can be obtained from satellite passes up to a couple of hours apart, or from similar passes, days apart.

NOAA-12 passes are about 22 minutes earlier each day, so passes a day apart can be used. In order to use two different satellites, the

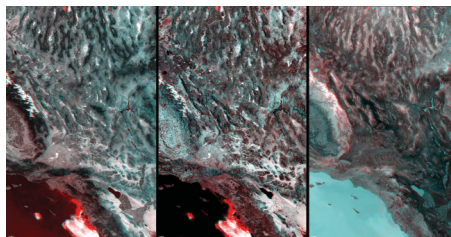


Fig 1: NOAA-15 0530UTC May 30 channels 1, 2 and 3 converted to anaglyphs
<http://www.goldrush.com/~aa6g/Images/>

passes must be spaced in the sky as though it was one satellite 20 - 40 minutes different; the passes must both be ascending or descending, and the time between passes should minimize shadow changes. NOAA-15 and FY-1D can be good pairs, but in the winter NOAA-15 passes are in darkness.

Chuck does the subsequent image processing in Photoshop; this involves brightness and contrast adjustment, the cropping of selected overlapping cloud-free regions, careful marginal distortion to match the images, and several other steps to ensure the process produces effective images.

If any reader is interested in having the full details, please e-mail me for a copy of Chuck's description. My thanks to Chuck for providing the details.

❖ NOAA-N launch postponed

The autumn launch for the next NOAA weather satellite – NOAA-N – has been postponed until (no earlier than) January 27, 2005.

NOAA-N will be renamed NOAA-18 once on orbit, and will transmit APT in the frequency range of 137.10 MHz and 137.9125 MHz. The APT frequencies will be moved to the outer edges of the 137 frequency to minimize interference found in the mid ranges. The APT bandwidth will be .034 MHz (34 kHz) with a data rate of .017Mb/s. HRPT will be transmitted on 1698 MHz or 1707 MHz with a bandwidth of 2.66 MHz and data rate of .665Mb/s.

❖ New instrumentation for GOES

NASA/GSFC is developing the Hyperspectral Environmental Suite (HES) for the Geostationary Operational Environmental Satellites (GOES). The HES is an infrared sounding and visible imaging instrument suite that will replace the current GOES sounder. Environmental data from the HES will be used by NOAA and other public and private agencies.

Frequencies

NOAA-12 and -15 transmit APT on 137.50 MHz

NOAA-17 transmits APT on 137.62 MHz.

APT (automatic picture transmission) comprises two side-by-side images showing visible-light and infrared scenes of the earth below. The satellites are about 840km above the earth, and transmit APT continuously.

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INDEX OF ADVERTISERS

| | |
|----------------------------------|--------------------|
| Antenna Warehouse | 91 |
| Antique Radio | 77 |
| Antique Wireless | 77 |
| AOR | Cover 2 |
| C Crane | 21 |
| Carey, Kevin | 81 |
| CIDX | 91 |
| Communications Electronics | 87 |
| Computer Aided Technology | 11 |
| Cook Towers | 85 |
| Cumbre DX | 91 |
| DWM Enterprises | 91 |
| Grove Enterprises | 9, 15, 75, Cover 3 |
| Hauser, Glenn | 43 |
| ICOM | Cover 4 |
| Monitoring Times | 3, 5 |
| Nil-Jon Antennas | 75 |
| ODXA | 91 |
| Palomar Engineers | 67 |
| Popular Communications | 79 |
| Radioworld | 15 |
| Scrambling News | 81 |
| Small Planet Systems | 21 |
| SWL-remotes.com | 27 |
| Talon Creative | 73 |
| Ten-Tec | 7 |
| Universal Radio | 77, 91 |
| WINRADIO | 1 |

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The Future of the Radio Hobby

By Larry Van Horn, N5FPW
Monitoring Times Assistant Editor

I sometimes think if I hear one more person tell me that the radio hobby is dying I might just go postal. What an "utter bunch of rubbish" as one British amateur radio friend says. I still haven't found the individual who started this "the radio hobby is dying" talk, but I have a sneaky suspicion I know at least which portion of the radio community promulgates it – some of our radio old timers. And why do these senior members of radio think the hobby is dying? Simply because they can't hear what they used to hear on their radios today.

The real problem as I see it is that they aren't willing to upgrade their receiving setups, increase their knowledge of today's radio bands, learn new receiving techniques and modes, or just aren't willing to listen to something new in the radio spectrum.

You Might Be an Old Timer If...

If you don't have a mental picture of the kind of radio listener I am talking about then I suggest you can find his peers by tuning around the 75 meter ham band in LSB – (that is lower sideband for you old timers still operating on AM). Just about any evening except Sunday before 10 p.m. local, which is their bedtime, you will hear conversations on the band from what one overseas ham author calls "the pig farmers."

So how can you tell if a radio hobbyist is one of these "old timers?" First, let me set the record straight. Age is not an indicator of a radio old timer. I have seen 70 year olds who could build their own PCs from the ground up, and on the other side of the coin, guys that have only been in the hobby 10 years or less who couldn't even find WWV or NOAA weather radio on their radio dial.

You can recognize a radio old timer by mentioning the one word that strikes fear in their hearts: just mention the word "digital" in any radio conversation, and you will see them turn pale, hang up the phone, and walk off mumbling what sounds like digital obscenities.

Another way to recognize them is that they have a hard time adjusting to new things such as getting rid of old, outdated frequencies. So to all you who are still tuning 11176 kHz looking for MacDill AFB, asking on the internet for the Miami Monitor and Hurricane Hunters' frequencies, wondering where the cruise ship communications and Morse code went, or who are still listing Aksarben in your callsign list, I have just one word for you – *digital!*

Staying in the Game

And that is why the old timers think the hobby is dead. They haven't kept up with the technology. Those that have made the adjustment to digital and other exotic modes in use today are enjoying some of the best days the radio hobby has ever given. After nearly 40 years in the radio hobby, I can truly say I am hearing more on the bands than I ever have before.

Let's look briefly at just the equipment aspect of this and you can see why I say today is the golden age of radio monitoring. When I first started in the hobby nearly 40 years ago, receivers were five tubes with an analog dial, and if you wanted to decode RTTY, you bought military surplus boat anchors to attempt reception of a fraction of the digital spectrum of the day – primarily RTTY.

Move forward in time and equipment has progressed from tubes to transistors to integrated circuits. Not only has communications evolved with technology, but so has the equipment

available to the radio hobbyist. Now in the age of the personal computer, we have at our fingertips technology to let us monitor just about any digital mode in use worldwide.

If you don't recognize any of the following terms and you call yourself a true HF utility monitor, then you are one of my old timers: 81-81, Bee 36-50, Coquelet, Crowd 36, Fire, GMDSS, Hellschreiber, Mil-Std-188-141, Pactor, STANAG 4285/4529, TOR Dirty, and Twinplex.

I can remember a few years back when *MT* columnist Jack Albert talked about a newly discovered digital mode known as "Piccolo" and told the radio community what it really was and who was using it. Twenty years before that I was sitting mesmerized in front of the warm glow of my Hallicrafters S-120 wondering what those strange transmissions were. Now, nearly a generation later I now have a decoder and the stable receiver needed to decode the Piccolo mode messages on my home computer.

Even the world of shortwave broadcasting is slowly phasing out the AM mode and turning to a digital medium to broadcast news, sports, music and features around the world.

The Digital Future

But the digital evolution doesn't stop at the shortwave spectrum's edge. In the world of VHF/UHF communications we are seeing a revolution occurring right before our eyes. Digital is coming to your area probably sooner than you think.

For instance, by the end of this year the government agencies in the 162-174 MHz band will be required to use the APCO-25 digital mode exclusively. By the end of 2007 the entire federal spectrum will use APCO-25. We have VHF railroad communications systems testing APCO-25, plans in the works for the civilian aviation community to switch to a mixed analog/digital format, and even talk of the VHF marine band going digital.

So where does the scanner hobbyist stand at this point in regards to digital monitoring?

Two things jump-started the scanner hobby from the malaise of the middle and late 1990s – trunk tracking scanners and APCO-25 digital decoders. And for this we have the good folks at Uniden to thank. As for the rest of the radio manufacturers, if you are going to compete in this bold new digital world, you are also going to have to embrace this new digital revolution or probably face decreasing sales and profits.

Even within the amateur radio bands we see Morse code usage diminishing and the digital modes on the up tick. Newer modes like Clover, GTOR, Hell Modes, MFSK16, MT63, PSK31, THROB and even digital voice communications are gaining in popularity within the ham community.

And the growth in the amateur radio hobby bodes well for the radio listening hobby. With over 637,000 licensed hams in the United States and the promise of even more hams in the near term, we will continue to see more advances in equipment which will have an impact on the radio listening hobbyist.

Is the radio hobby dying? Only if you want to listen to the days of radio long past. I don't see our radio glass as half empty, I see it as half full.

This page is open to thoughtful opinions on radio-related topics. Views expressed on this page do not necessarily reflect the opinion of Monitoring Times or Grove Enterprises.



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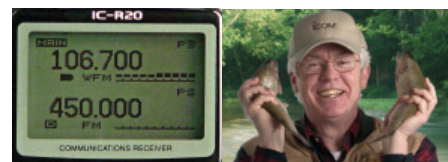
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